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THE HOBOKEN INCLINED CABLE RAILWAY.

The southern end of the Palisades, with its steep and rugged sides, has always presented a formidable obstacle in the path of the horse car railroads of Jersey City and Hoboken. Steam railroads overcame the difficulty by tunneling and open cuts, their main object being to pass the hill; but the horse cars, having to mount the hill to accommodate residents upon the Heights, were of course compelled to resort to other means. Twenty years ago dummy engines were tried on the routes leading from Hoboken ferry, but the grades proved to be too steep, and they were abandoned. Horses, four to a car, were again employed, and it took twenty minutes to reach the top of the hill from the ferry, a distance of only one mile. In 1873, the North Hudson County Railway Company concluded to construct a short but steep inclined plane, and to elevate both cars and horses by stationary steam power. A car and horses arriving at the foot of the hill passed on to a large and substantial truck and were drawn up the incline, 400 feet long and 100 hundred feet high, in one minute.

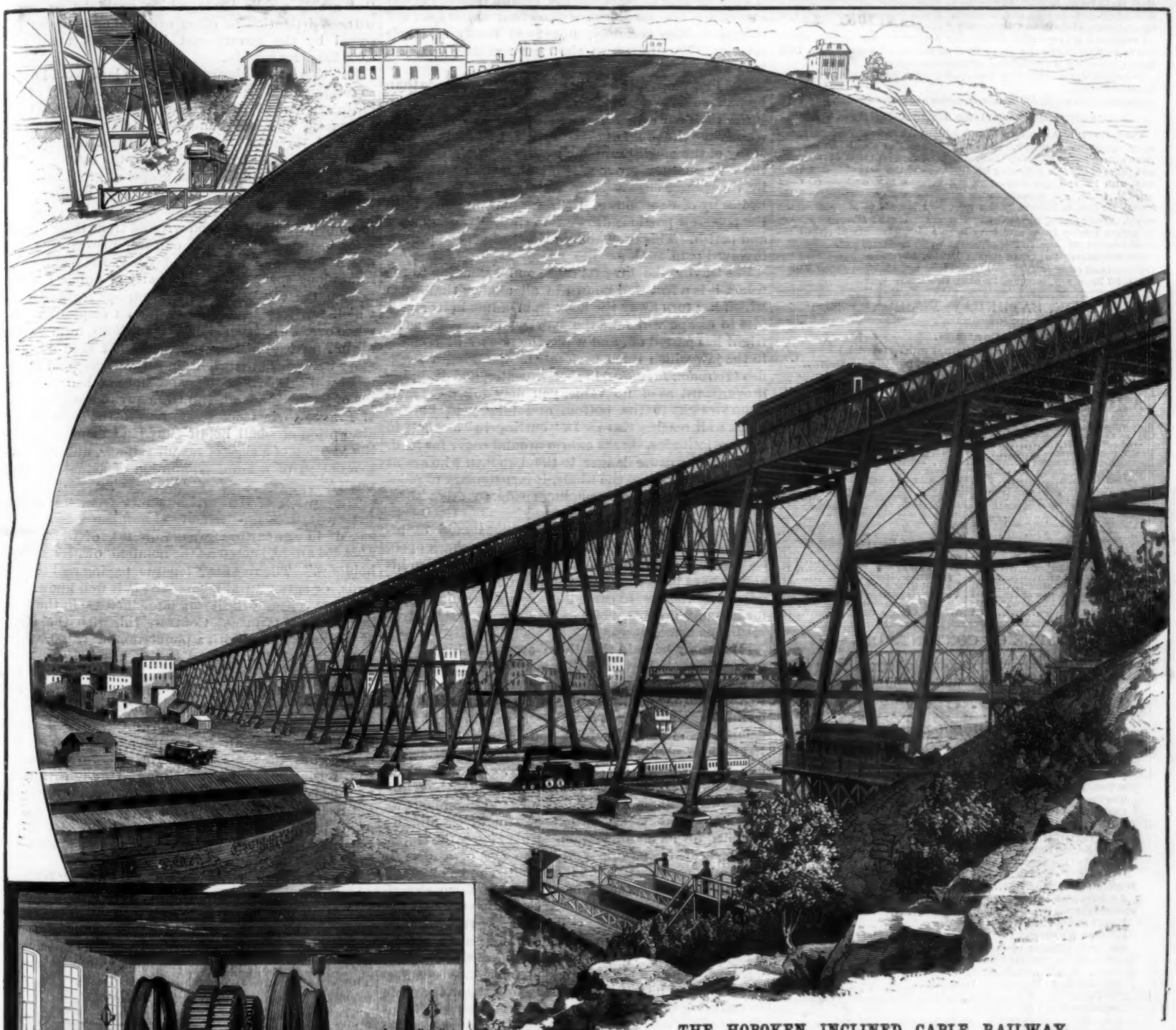
This was the first horse car elevator either in this country or Europe. It has been in continuous operation ever since completion, and has never failed to work or caused an accident.

The truck, or elevator platform, is triangular in shape; the hypotenuse is provided with four sets of wheels, which run up a track extending up the incline. When at rest, the horizontal side of the truck is on a level with the main track, either at the bottom or top of the hill, and is of sufficient length to receive a car and horses. There are two of these trucks, one upon each track. Two wire ropes lead from each car around drums operated by engines at the top of the hill. The cables are so arranged that one truck passes up while the other is going down. A third cable, attached to each truck and passing around sheaves at the top of the hill, serves as a safeguard in case either set of hoisting cables should break.

The travel increased to such an extent as to make necessary the providing of additional facilities for mounting the hill. It was therefore concluded to build the elevated railroad shown in our frontispiece. This easily accommodates all the travel, and also shortens the time to the top of the hill from ten minutes to five.

The most difficult task was to secure proper foundations for the posts. Soundings made between the ferry and hill showed the solid bottom to be from 20 to 90 feet below the meadow. At no point could a firm foundation be secured without piling. The higher part of the structure rests on towers 50 feet wide at the base and 22 feet wide at the top. Each of the four corner posts is set in heavy castings which rest on bluestone and brick piers 10 feet square at the bottom and 4 feet square at the top; these piers are built upon cross timbers which hold together clusters of 16 or 20 heavy piles. The foundations for the ordinary posts on the level part of the structure are of a similar character, but not so heavy. The structure is entirely of iron. The tracks are of 67 pound steel rails, not laid on wooden cross ties, but on white oak

(*Continued on page* 116.)



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THE HOBOKEN INCLINED CABLE RAILWAY.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 529

For the Week Ending February 20, 1886.

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SEAT AND ORIGIN OF PAIN.

Pain is so habitually associated with the *nerves* that it may seem at first absurd to speak of its having its seat and origin anywhere else. We know that one grand function of the general nervous system is to transmit sensation, which, when it is unpleasant, we call pain. We know that the posterior roots of the spinal nerves have this apparently for their exclusive function. This cannot be denied, and yet we find a factor of so much greater significance and power in respect to the existence and the degree of pain, that though its transmission is dependent on nerve fibers only, we may fairly say that its seat and origin are beyond, and are truly not physical at all. Pain is *mental*.

Of course we do not intend by this to assert that there is no physical pain, but we do assert that apart from mental activity the degree of pain which exists throughout the domain of animal life is relatively so much less than what our sensations induce us to believe that, if we were able to eliminate the mental element in our experience, the *pains* we so often bear would lose, not their existence certainly, but most surely all their severity. We propose to show our reasons for such a belief.

The first point is this: all animals of lower grade than human suffer very much less pain from physical injuries than our own sensations convey to us. We can readily see the proof of this in their habitual actions. Many of the starfishes detach parts of their arms, at the very smallest provocation, and remain uninjured by the change or loss. The Holothurians pinch their bodies by contractions of their circular muscles until the posterior portions drop off in successive fragments and perish. This they would scarcely do if the process involved pain.

But leaving the invertebrates, and ascending to the fishes, it is a fact well known to all anglers that a fish which has torn away the hook from a line in its struggles to escape will take the bait again as soon as its fright has passed off, and while the hook still remains in the jaw which it has perforated. Catching a swellfish (*Tetrodon turgidus*) in shallow water, and dropping it overboard as of no value, you may any day see it swim straight to the bottom and take your bait as quick as it reaches there. In "cutting in" a whale in the low latitudes, sharks swarm around eager for food. As they may cause danger to the two men who are at work on the body of the whale, it is customary to place a man on watch with a whaling-spade to drive them away. It is great fun for him, and he chops the sharks without mercy. Very often a vigorous blow of his keen-edged spade lays the whole side of a shark open, leaving his intestines exposed and floating out from his abdomen as he swims, and yet this does not stop him or seem at the first to cause him any special annoyance, for he snaps up every bite of blubber he can get as readily as before.

But it may be said that these are cold-blooded animals, and probably very little sensitive. Turning, then, to a grade much higher, a single incident may suffice to illustrate our point as well as a detail of many others could do. One day a young deer was brought into camp whose fore leg had been broken by a shot. In the hope of saving it for a children's pet, we decided to amputate the leg near the shoulder. No chloroform was at hand, and the amputation was made without any anaesthetic. This very subject of pain in animals we had in careful consideration at the time, and we watched for its manifestation. But scarcely the slightest sign of it was apparent. The eye of a deer is singularly expressive; and if any faith can be placed in such tokens, the actual pain which that fawn experienced during the operation was certainly very slight.

Once more, and coming still higher, we recognize the fact, which is perfectly well known, that savages of the human race pay small attention to injuries at which our more polished classes would manifest intense suffering. It may be said that it is because they take pride in enduring the pain, and therefore make no manifestations. This may possibly be true in some cases, as for instance in the presence of hostile assailants, etc., but other circumstances show quite conclusively that they really feel the pain in only small measure. One of the missionaries in Damara-land stated, not long since, that the natives there are constantly covered with blisters which to us would be fearfully distressing, but which they almost totally disregard. The origin of the blisters is the curious point. They crowd up so closely to their camp fire, for the sake of the pleasant warmth, that the skin is burnt before they become conscious of the fact, and the heavy blisters are the result.

Still again, every surgeon sees convincing proof in his daily experience that the sensitiveness of his various patients varies so widely that there must be some cause for it beyond that which is physical. There is no such wide diversity in the nerve tissue of their systems, either of the cells of gray matter or the fibers of white matter, as can account for the extreme differences with which they not only manifest pain, but with which they doubtless feel it; and he also knows well that the mental attention may be assuredly so totally abstracted as that the body shall be completely insensible to pain.

Now, we by no means propose to encourage "cruelty to animals" because we argue that they suffer less than has been commonly supposed. The old statement, that when we step on a worm we cause it as great a pang "as when a giant dies" (Query: why *giant*?), may stand well in poetry, and serve a good purpose. We only put forth these views as having an important physiological and psychological import.

THE EXHAUSTION OF THE PUBLIC DOMAIN.

We think the facts stated in an article in the January (1886) number of the *North American Review*, entitled "Landlordism in America," demand the grave and careful consideration of all who have believed in the possibilities of a better government on this continent than any yet attained in Europe.

It will be a matter of almost startling surprise to most people, and to many who are much better informed than the average, that out of 25,560,000 acres "of arable public lands, which could be cultivated without irrigation or other artificial appliances," possessed by the government in 1879, not more than 5,000,000 acres remain.

But this rapid absorption of the land would not be so serious a matter—in fact, would be a subject of congratulation—had the fertile regions so rapidly taken up passed into the hands of industrious farmers in plots of 160 acres, as the government originally intended. Unfortunately, this is not the case.

It seems almost that the gospel of greed has taken fatal possession of the people of this country. The tricks, subterfuges, and frauds by which laws intended to be beneficent have been wrested from their purpose—for instance, the timber culture, pre-emption, and desert laws—and made to play into the hands of unscrupulous speculation; the laxity of public administration, the careless and unscrupulous legislation, by which territory large enough for an empire has been made over to irresponsible corporations, form a chapter in American history which will not shed a halo of glory upon our institutions in future ages; and all the more will this darken the page, since we had the example of Rome, England, and Germany to warn, and that of France to instruct us, both as to the danger of the absorption of small holdings by land monopolists and the creation of a class of tenant farmers, and the value to a nation of a rural population of actual owners of small farms.

The author of the article shows from the census that five years ago "the total number of persons engaged in agriculture was 7,670,493, of which only 2,984,306 are registered as the nominal owners of their holdings." The rest are "tenants paying rent to landlords, or agricultural laborers." It is well known that the next census will show a large increase in the number of tenant farmers. Contrast this with the status of France, which, with a population of 12,000,000 less than that of the United States, has 5,000,000 rural *proprietors* holding less than 20 acres apiece and working their holdings with their own hands, and 2,000,000 proprietors of holdings of more than 20 acres apiece. An array of most important facts besides those to which we have directed especial attention are presented; but the most un-American feature of the entire business is the obtaining through indirect methods of large tracts of lands by foreigners who do not reside in the country, and some of whom do not even pay taxes here, these lands being let out to tenants with all the pleasant features of landlordism in England and Ireland.

One notable instance is cited—that of an "Irishman who has earned an unpleasant notoriety as a landlord in his own country." This man owns over 80,000 acres of land, 40,000 acres being in one county, and derives over $100,000 cash rental from the estate, which is sent to him to spend in England, where he resides. The tenants are required in their leases to pay the taxes on the property occupied by them.

We cannot give space to further comments upon the important and timely publication of these facts and figures, which show, however surprising the statement may be, that America possesses now the largest class of tenant farmers of any existing nation.

Paper Pipes.

In Vienna there were recently exhibited gas and water service pipes made of paper. The same kind of pipes will do for many factory purposes, and for laying electrical wires, etc., we should suppose it to be specially useful. The pipes, according to the *Paper World*, are made as follows: Strips of paper are taken, the width of which corresponds with the length of one pipe section. The paper is drawn through melted asphalt, and wound upon a mandrel which determines the inner diameter of the pipe. When the pipe thus made has cooled, it is pulled off the mandrel and the inside is covered with a kind of enamel, whose nature is kept secret by the makers. The outside is painted with asphalt varnish, and dusted over with sand. It is stated that such a pipe will resist some 2,000 pounds internal pressure, though the thickness of the stuff is only about half an inch.

ALUMINUM IRON AND STEEL.

T. Nordenfelt, of London, has taken the following English patent:

It is well known that one of the great difficulties in making castings from steel is to get a product which is solid, sound, homogeneous, or free from blisters or cavities. Lately the manufacture has been much improved by adding to the metal ferro-manganese and other compounds containing carbon, silicon, and manganese. But although these admixtures make the product somewhat more solid, they deteriorate the quality in other respects, as the product gets harder and more brittle or red short. It has been impossible to make castings of wrought iron or mild steel at the same time solid and retaining their qualities and their strength.

I have found that castings of wrought iron or mild steel may be obtained solid without changing the intrinsic quality of the metal, by the addition of the metal aluminum either alone or in the shape of an alloy. The aluminum makes the molten metal more liquid, thus the gases in the metal pass easily away, the metal runs easily into the moulds, and a more perfect product is obtained. I have found that even a minute quantity of metallic aluminum added to the molten iron has an appreciable influence.

By this, my new invention, I have succeeded in making perfect castings from the softest wrought iron, which castings in every respect retain their ductility and nature of wrought iron, though their tensile strength is greatly enhanced.

The iron or steel is melted in crucibles, converters, or metal smelting furnaces of any description, and the addition of the aluminum or alloy of aluminum is made to the metal when molten, shortly before it is to be poured. The addition may, however, be made earlier.

It is convenient to provide a plug in the cover of the crucible, which is removed when the metal is completely melted, a tube is inserted into the aperture, and the aluminum to be added is passed down the tube. The tube is removed and the plug replaced, and the metal is soon ready for pouring.

What I claim as my improvements in the manufacture of castings from wrought iron and steel is the admixture of metallic aluminum or aluminum alloy with the melted iron or steel before casting the same into moulds, substantially as described.

THE ICE PALACE AT ST. PAUL.

BY H. C. HOVEY.

The saying that "men are but grown-up children" is well illustrated by the building of costly edifices of a substance known to be ephemeral in its nature, and that can be of no conceivable utility while they last. Yet they take their place among human affairs, and are occasionally worth describing even in the sober columns of a scientific journal.

The "St. Paul Ice Palace and Winter Carnival Association" has been incorporated for the term of thirty years, with the intention of building a palace and holding a festival every winter. The success of its first attempt has been marred by the remarkable instability of the weather—which can usually be depended on in this latitude. While there have been a few very cold days, this has been comparatively "an open winter;" and fears were at one time had that the project would actually have to be postponed to another year. But, at last, a favorable cold snap came, and the structure was reared.

Building with ice is, of course, in some respects, very much like building with granite or marble; yet it has its peculiarities. The quarry is the frozen Mississippi River, from which blocks may now be cut twenty inches thick and as clear as crystal. The first thing done is to scrape off the snow and soft surface ice, which is effectually done by a wooden scraper fifteen feet long, drawn by horses. Next the smooth surface is marked off by steel knives set in a wooden beam, the area thus treated resembling an immense checker-board. These teeth are adjustable, so that blocks of the various sizes required can be marked off. Sawyers then cut the ice, following the lines already thus traced. By means of hooks and poles, the blocks are lifted from the water and placed on long sleds in waiting, and drawn to the site of the building. Heavy tongs and derricks are next in requisition to swing the blocks to their places, where masons are ready with suitable tools for chipping off the rough parts, so that each block shall fit snugly to its place. Water is then poured into the seams, where the cold at once congeals it, thus cementing the wall as it goes up. Work so simple as this progresses rapidly, and repairs that may be needed can be readily made as long as cold weather lasts.

A noble location was secured for the ice palace, comprising eight acres in the very heart of the city, and adjacent to the State Capitol. In the center of this broad area rises the glittering structure, 180 ft. long, 154 ft. wide, with towers 106 ft. high. The architectural design is excellent, with square towers and round ones, and various arches, flying buttresses, and other features. Thirty thousand blocks of ice were used in completing the structure, and 200 men were employed in its erection. The total cost has exceeded $20,000, including approaches and decorations. The interior is divided into spacious halls, chambers, and corridors, with a stairway for reaching the summit of the main tower. In several rooms there are elaborately carved statues cut from huge blocks of ice, and with so much skill that one can only regret that the labor has been expended on such fragile material. Imagine Powers' "Greek Slave" reproduced in rock crystal! Many of the blocks in the walls are so very clear as to take a rich blue color from the blue sky overhead, while others on which the rays of the sun directly shine seem like dazzling cut glass. At night the building is lighted by electricity, and fine artificial effects are also produced by colored lights and pyrotechnic displays.

The surrounding grounds are decorated with evergreen arches, and in other ways. A village of sixty Sioux Indians, with their skin tepees and primitive features of aboriginal life, is located in one corner of the extensive park. Elsewhere there are ponds for skaters and curlers, areas for snow-shoe races, slides for the tobogganers, and provision for other winter diversions.

It might be added, that, along with the ice palace, has come a wholesome epidemic for out of door recreations, in which people readily indulge, even though the mercury may fall far below zero. Toboggan slides have been constructed at St. Paul and Minneapolis, some of which are more than 1,500 feet long. More than one hundred snow-shoe clubs have been organized in Minnesota during the past two months, with not less than 4,000 uniformed members.

Since writing the foregoing account, the warm "Chinook" has come, which threatens the speedy destruction of the ice palace if it should last many days. It is interesting to note the effect produced on the blocks near the foundation of the massive walls. Of course a great pressure comes upon them, and as they begin to thaw they assume a columnar structure, each block seeming to be made up of hundreds of slender prisms. Possibly before this appears in print, the whole fairy-like palace may have dissolved, "like the baseless fabric of a vision;" but as a feature of Northwestern enterprise at play, it is worth describing.

PHOTOGRAPHIC NOTES.

A New Enlarging Easel.—At a demonstration showing the utility of the permanent bromide paper for enlarging purposes, recently given before the Society of Amateur Photographers in this city, there was exhibited and used a new easel for holding the paper, which had been presented to the society by the Eastman Dry Plate and Film Co.

The easel was intended to facilitate the placing of the paper in position to receive the enlarged image, and fulfilled the purpose very perfectly.

Upon a square frame which rested on the floor were secured two uprights rising four and a half feet; in these were longitudinal slots and grooves. The exposing screen, covered with smooth, hard, white paper, was slid down between the uprights, in the grooves, and held at any desired height by clamping screws which passed through the slots to holes in the edge of the exposing screen; to raise or lower the latter it was only necessary to unscrew the clamping screws. Hinged to the front of the exposing screen was a black, wooden clamping frame, swinging open like a door, and caught at the other side of the screen by a flat spring catch.

In the door frame could be put kits of smaller size for convenience in securing small sheets. On brackets at the top of the screen was supported a neat rectangular box about six inches square, divided into two parts, the upper portion being hinged at the rear upper corner. When the cover was opened, the paper, could be fed out of its lower corner directly on to the face of the exposing screen. The roll of sensitive paper having in its center a wood spool, was supported between two uprights fixed on the inside ends of the box, so arranged that the spool could be easily lifted out or dropped into place. A spring pressure bar pressed against the surface of the roll, preventing it from unwinding too rapidly.

To operate the easel, the hinged frame was opened, then the cover of the box; the free end of the paper was next brought down over the face of the exposing screen; then the lid of the box was dropped, and the door frame shut and latched, which firmly clamped all the edges of the paper in position and prevented it from curling. After exposure, it was only necessary to cut off the exposed portion with a pen knife and tuck back into the box holding the paper the free end of the roll. The operation of affixing the paper was extremely simple, entirely dispensing with the bother of pinning to the screen a large loose sheet, which has heretofore been the usual way of doing it. The easel was adaptable to different widths and rolls of paper, and single loose sheets could be easily located in position. It will be seen that the convenience afforded by the employment of this easel will doubtless bring it into very general use.

Spectacle Photographs.—At the same meeting at which the enlarging easel was shown, there was exhibited a 5 x 8 photograph, remarkable for its clearness and depth of focus, made with an ordinary spectacle lens, inclosed in a common wood pill-box for a lens tube, the whole said to cost but twenty-five cents. Every portion of the picture appeared to be perfectly sharp. We have obtained the following particulars: The glass is a common spectacle meniscus (periscopic), having in the rough a clear diameter of 1½ in. and focal length of 18 in.

Generally these glasses are not round, but can be cut by any spectacle maker to fit the metal frame.

In one end of a wood pill-box with the bottom removed was placed the lens with its concave surface outward, and one inch forward in front of this concave surface was the diaphragm, ¼ in. in diameter.

Respecting these lenses, it was said that there was no reason to suppose that for comparatively long focus they should not in a measure supersede many of the cheaper forms of achromatic lenses for amateur work; since they are so extremely thin, the chromatic aberration is practically unimportant, while the spherical aberration is also reduced to a minimum.

The rapidity of spectacle lenses is also somewhat remarkable. The exposure given to the plate was said to be but three seconds.

The spectacle camera will doubtless present a favorite means for beginners to practice photography, especially to boys and others who cannot afford expensive apparatus.

Upholstering a Cow Stall.

A neighbor who uses an old horse barn for keeping his one cow, found that when the thermometer indicated from 10 to 20 degrees below zero, his cow stood shivering in her stall, even with an abundance of good food to eat and warm water to drink, and that the quantity of milk given was also reduced below the usual flow. Being ingenious as well as merciful, he went to work, with such material as he could find at hand, to make his animal more comfortable. The stalls were ten feet high, the stable large, and the outside boarding somewhat loose. In other words, the ventilation was abundantly provided for. To recover the entire building was out of the question, and even were the outside fairly tight, so large a barn with only a single animal in it would still be excessively cold with such a temperature outside. The better way seemed to be to make a small room for the cow, in which her own animal heat would be better retained.

Accordingly, a single horse stall was floored over with loose boards above the cow, giving just room for the attendant to stand. This floor was then covered with old hay and straw to the scaffold floor above. The sides of the stall were made tight by battens and stuffing, and the front closed up with a door that could be opened for putting in the food at feeding time. At the rear, the supply of boards having been exhausted, old carpets, sacking, etc., were hung in several thicknesses across the stall from side side, being tacked securely to the staging above. The cow was thus shut into a room but little more than large enough to contain her with comfort, and comfortable it was compared to the large open space she had previously occupied. Much might be done in this, or other ways, to render farm stock more comfortable and more profitable to keep during these excessively cold spells. If stables are tight, and not too large in proportion to the number of animals, their own bodies will warm the air sufficiently for comfort. There is little occasion to worry about ventilation when the temperature gets below zero. The danger, in nine cases out of ten, is in having too much rather than too little.—*N. E. Farmer.*

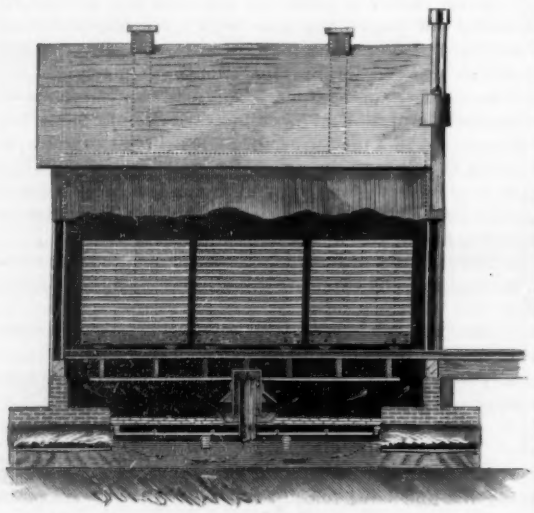
Preparation of Paraffine Moulds for Plaster Casts.

BY F. L. TETAMORE, M.D., OF NYACK, N. Y.

Prepare the specimen or preparation, making it as clean as possible; place on oiled paper, in a position that will show it to advantage. Soft projections may be held in position with threads suspended from a frame or from a heavy cord stretched across the room. Paraffine melted in a water bath is painted over the preparation with a soft brush, the first layer being put on with single and quick strokes, that the rapid cooling of the paraffine may not cause the brush to adhere to the preparation, thus drawing the soft tissues out of place, until the mould is formed about one-eighth inch thick; all undercuts must be well filled. When the mould is hard, it can be readily separated from the preparation; it is then well washed with cold water. Stir fine dental plaster into cold water to consistency of cream, pour into the mould and out again several times, so that there will be no air bubbles on the surface, then fill the mould and let it stand until hard. Place the whole in a vessel containing boiling water until the paraffine is all melted; wash with clean boiling water. When the cast is thoroughly dry, it may be painted with oil colors by coating it first with shellac varnish. Casts of any part of the body may be made from a living subject, if the parts are not too sensitive to bear the heat of the paraffine, which is about 130° Fah.—*Annals of Surgery.*

LUMBER DRIER.

This kiln is designed for drying lumber by the direct application of heat obtained by the combustion of fuel in a suitable furnace. The kiln consists of a framed structure provided with a sliding door, through which the lumber is introduced and removed upon cars running upon properly laid rails. Cold air flues are connected with the lower part of the kiln, and carried up on the outside to a level a little above the top of the roof. The smoke flues in the top of the kiln pass



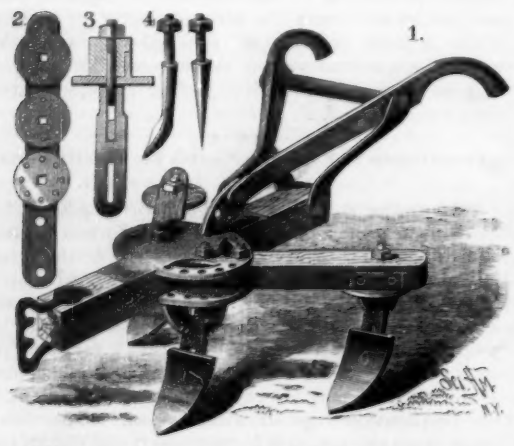
DUKE'S LUMBER DRIER.

through the roof, and carry off all the waste heat, smoke, and vapor from the lumber. In the lower part of the kiln is the furnace, which is fired from the outside at both ends. A curved iron plate covers that part of the furnace within the kiln; over this plate is an air space formed by a flat plate. Connected with the furnace is a flue extending upward into the kiln. Just above the furnace, and surrounding the flue, is a pan containing water. Over the top of the flue is a hood, reaching nearly to the surface of the water. A guard plate is secured round the hood, so as to cover the exposed portion of the pan. The hot air and gases given off from the furnace pass up through the flue and are deflected downward on to the surface of the water; sparks fall into the water, while the hot air ascends in the direction shown by the arrows into the interior of the kiln. The guard plate serves as an additional protection to throw the sparks into the water, and also prevents the pan from being filled with any rubbish falling from above when the kiln is being filled with lumber.

This kiln is the invention of Mr. O. A. Duke. Further particulars can be had from Messrs. Bivings, Duke & Co., of Clanton, Ala.

COMBINED PLOW, CULTIVATOR, AND HARROW.

Secured to the upper and lower sides of the central beam are two plates, the side parts of which are made semicircular and are formed with a series of holes near their edges, and also with holes at the centers of the circles to receive bolts which hold the side beams; by



COMBINED PLOW, CULTIVATOR, AND HARROW.

removing the outer bolts the side beams can be swung upon the inner bolts, as pivots, into any desired position, where they can be secured by replacing the bolts. The standard of the center plow passes through center holes in the plates, and is held by a nut screwed on its upper end. The side standards pass through circular plates held to the lower sides of the outer ends of the side beams and through the beams, and are held by nuts. The standards, Fig. 3, are made in two parts, hinged to each other near the lower sides of the beams; the lower parts are curved forward to bring them into proper position to receive the plows, which are held by bolts passing through slots in the ends of the standards. Near the edges of the circular plates are holes to receive the ends of curved bars which pass through the upper ends of the lower parts of the standards. The lower edges of these bars have teeth that support the lower parts of the standards. With this construction the pitch of the lower parts of the standards can be readily adjusted. The ends of the curved center bar are inserted in holes in the lower plate. The handles are constructed as shown.

The side beams can be arranged as shown in Fig. 1, or one or both can be swung forward, according to the work to be done. When the plow is to be used as a cultivator, the side beams, Fig. 2, are used. The shanks of the cultivator teeth, Fig. 4, pass through the circular plates, which, in this case, are held from turning by pins which enter holes in the plates, so that the teeth can be adjusted as the position of the beams may require. When used as a harrow, side beams are employed, having holes to receive the harrow teeth shown in Fig. 4. It will be seen that, no matter in what position the plow may be adjusted, it will be firm and strong.

Additional particulars concerning this invention can be had by addressing Messrs. C. Audirsch and W. W. Strickland, of Gurdon, Ark.

Axial Change of the Earth.

On the last day of the year, the earth was in perihelion, or at its nearest point to the sun. At that time, the distance between the two bodies was about three million miles less than during our northern summer, in July. Though the earth now receives six per cent more light and heat, the northern part of its axis being turned away from the sun gives us the cold of winter. There is, however, a greater equality of temperature—bad as we are apt to call it, when the daily range may be from forty to fifty degrees—on account of this proximity of the earth and sun in winter and their distance in summer. In the southern hemisphere, the extremes of temperature would be almost unbearable under the present regime, were the land disposed as at the north; for there the conditions are reversed, and the sun is nearer in summer than in winter. The effect, however, is largely counterbalanced by the great predominance of water in that hemisphere. Less marked extremes are possible in the presence of such large bodies of water than would be the case at our own land-engirdled North. But the present order of things is not permanent. Nature is never stationary, and after some thousands of years the orbit of the earth will be changed. Other things being equal, the extremes of heat and cold in the northern hemisphere will then be unprecedented.

ADJUSTABLE DOUBLE BEDSTEAD.

The bedstead is provided with four hollow legs open at the top, and united by the head and foot pieces and the side rails; within these legs are sliding posts united by end pieces and side rails, which pass through vertical slots in the legs when the upper bed is lowered. In the foot piece of the main bedstead a drum is journaled; mounted on the shaft of the drum at the outside of the foot piece is a ratchet wheel provided with a handle for turning it. Secured to the bottom of each sliding post is a rope; all four ropes are carried over suitable pulleys to the drum, which is formed with four grooves, one for each rope.

When the bed is not in use, the upper section rests upon the lower; if but one person is to occupy it, no change is necessary. But if it is to be occupied by two persons, the drum is revolved, and, winding up the cords, the sliding posts are lifted up and out of the top of the legs. Latches in the hollow legs engage with racks on the sliding posts, and hold the upper section at any desired elevation. A cord passes from each latch to a slide in the foot board; by pulling this slide all the latches may be withdrawn to release the sliding legs and permit the upper section to be lowered. This double bedstead only requires the space now taken by a single bed; it can be quickly adjusted at any desired height, and the upper section can be easily lowered. The mechanism is so simple as not to be liable to disarrangement.

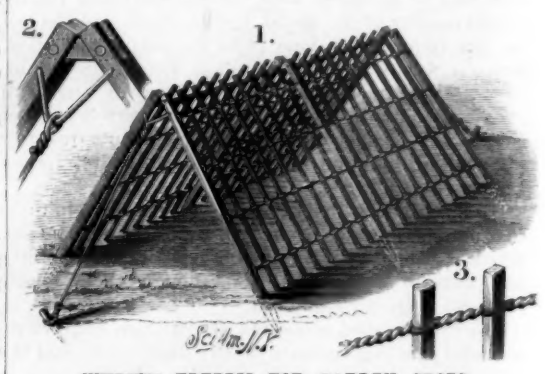
This invention has been patented by Mr. A. T. Schlichting, of 1986 Third Avenue, New York city, who will furnish all further information.

A Fortune for a Patent.

The *Mechanical Engineer* says that Benjamin Lauth, Sr., the inventor of the process of making nail plate out of old steel rails, has sold the right of his patent to five Eastern firms. Mr. Lauth claims that by his process at least $10 per ton can be saved on the manufactured product, as compared with the present methods of production. Mr. Lauth will receive $150 per day for one year and $300 per day for the remaining sixteen years of the life of the patent.

TRELLIS FOR GARDEN CROPS.

The portable garden trellis here illustrated is for use in growing peas, tomatoes, and other crops requiring support; it may be folded up and put away when not needed. The view, Fig. 1, indicates two continuous sections, composed of independent side frames, inclined toward each other and united at the top. Each frame has a picket at each end and intermediate bars or wires arranged parallel with the pickets, but of less length, so that when the pickets are driven into the ground the bars will only come to the surface. The pickets and bars are united by any number of rows of wires. The upper ends of the pickets are hinged together, as shown in Fig. 2. When set up, the trellis may be held firmly by ropes attached to the upper ends of the end pickets, and secured by stakes driven into the ground. In applying the trellis to supporting peas and beans, the



WHITE'S TRELLIS FOR GARDEN CROPS.

plants will be inside, while tomatoes should be outside of both the opposite frames.

The use of this trellis, which has been recently patented by Mr. Wm. A. White, of Staatsburg, N. Y., will enable the grower to produce a larger crop from the same amount of ground than by the use of pea brush or stakes, and will also keep the vines and fruit in a cleaner condition.

The Causes of Sudden Death.

The recent sudden death of Vice-President Hendricks, followed so soon by that of William H. Vanderbilt, naturally invites inquiry into the causes which produce these startling effects.

An editorial in the *Medical News*, of Philadelphia, states that disease of the vascular system—the arteries and veins—is most frequently responsible for this mode of death. The greatest strain in the case of those subject to mental anxiety or excitement is borne by the circulatory system; and the slow and unsuspected course of the disease gives no warning in most instances, and death ensues either from a rupture of some of the large vessels near the heart, or, as in Mr. Vanderbilt's case, one of the more important blood vessels in the brain proves to be the weakest link in the chain, and death from apoplexy results.

SCHLICHTING'S ADJUSTABLE DOUBLE BEDSTEAD.

The *Daily News* of Philadelphia, referring to the article in the *Medical News*, adds: "There is no treatment which will prevent this class of sudden deaths, and physicians are powerless to avert its onset. All they can do is to advise a calm, unexciting mode of life, with freedom from worry and anxiety. Such advice is very easy to give, but as difficult to follow as would be a suggestion that it is not advisable to die at any given time."

IMPROVED STONE CHANNELING MACHINE.

Blasting plays an important part in the quarrying of stone for burning lime, for road-bed ballast, rubble, street pavement, and is still resorted to in slate quarries; but in that important industry, the quarrying of dimension stone, the blast is now seldom heard, and the channeling process is daily growing in favor. This process consists in cutting long, narrow channels or deep grooves along the floor of the quarry, for the purpose of freeing the sides of the blocks of stone to be taken out. After the channels are cut to the required depth, and a free face obtained along one of the cuts, the next step, if there are no free beds, is to release the mass at the bottom. This is done by means of a "gadder," and consists in drilling or "gadding" a series of horizontal holes along the bottom of the bench, and in line with the new floor, and then releasing it by the splitting action of wedges, or "lofting" it, as it is called by quarrymen.

After the bench is thus raised from its bed in mass, it is next split into blocks of the required thickness or dimension by means of wedges or plugs and feathers. The process of cutting up the blocks after the channels are made varies somewhat in the different quarries, according to the nature of the stone, but the method above described is the one most generally used, and will serve to illustrate the principle.

It is thus seen that the channeling process is not, as it is popularly supposed to be, a complete cutting out of the stone in blocks; but it is a means by which artificial seams or beds are produced in positions most favorable for the action of the wedges or plugs and feathers.

The accompanying illustration represents an improved channeling machine recently introduced by the Ingersoll Rock Drill Company, of 10 Park Place, New York, the engraving being made from photographs taken at the Ohio Sandstone Quarries, which have not been slow *to adopt this* improvement. The apparatus consists of a direct-acting engine, having the piston and valve of the standard Ingersoll "Eclipse" drill, with a gang of cutting tools attached to a crosshead which is fixed to the piston rod, the whole mounted in a vertical position upon an adjustable support, fixed to a carriage which moves automatically upon a portable track laid alongside of the cut about to be made.

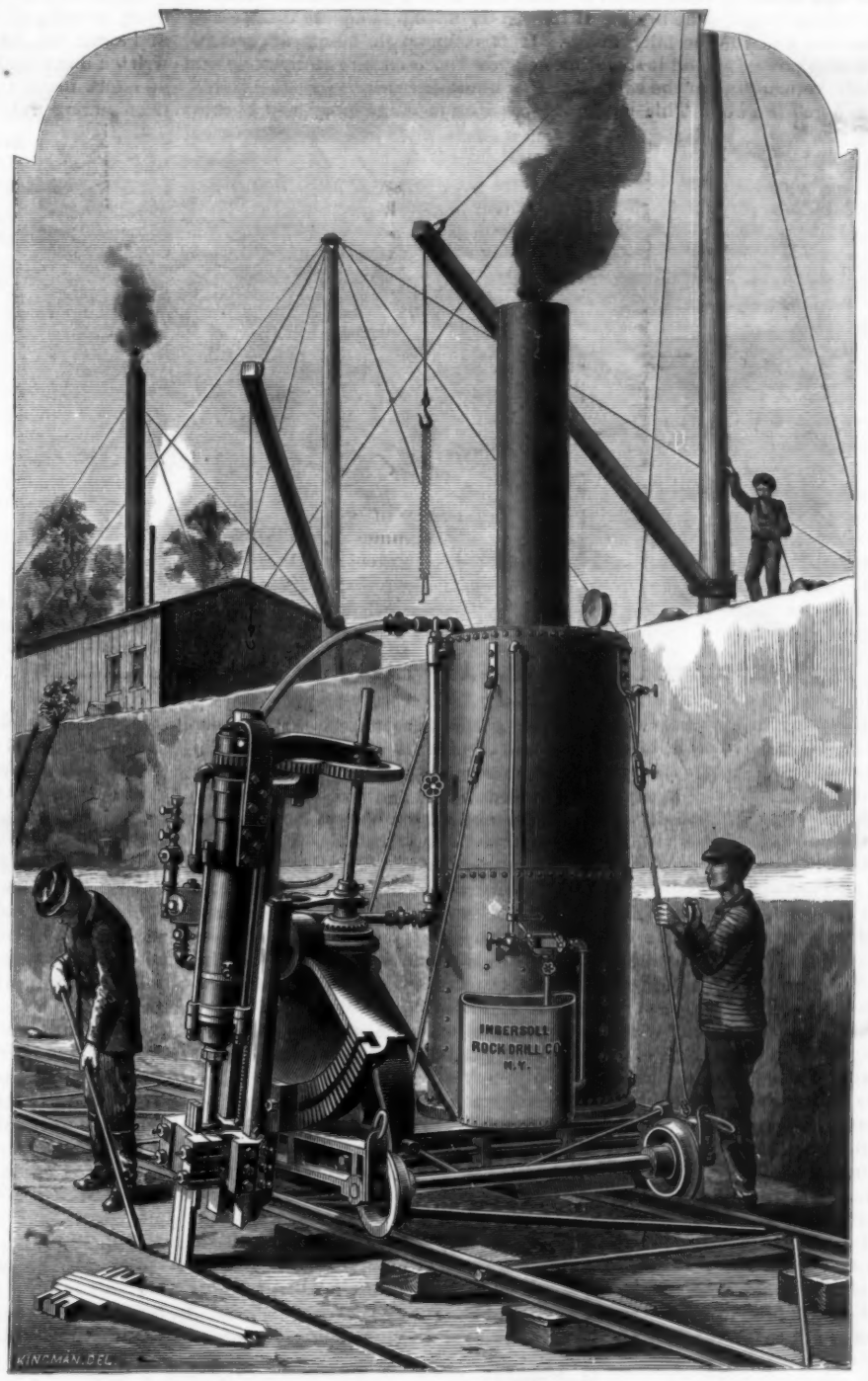
This machine is direct-acting, that is, the cutting tools being attached rigidly to the piston, the blow is dealt directly by the steam pressure in the cylinder and without any intervention of crank shafts, levers, or springs. The feed motion of the carriage upon the track is operated by and dependent upon the engine which strikes the blow. This is the only direct-acting channeling machine which possesses this feature.

This feed motion is imparted to the car on the upward stroke of the piston only; the car remains stationary when the blow is struck. This feed averages three-quarters of an inch per stroke. The strokes average 240 per minute.

As the cutting tools are made adjustable to any angle to the right and left, and forward and backward, the machine is capable of making transverse and side-hill cuts, and does what is known as cutting out the corners in quarrying. The machine has but two quick-moving parts—the piston, with cutting tools attached, and the valve. The stroke varies about six inches in length, running from two to eight inches. This is accomplished without extra parts or mechanical adjustment. The machine will start with a stroke of three inches, and continue operating without attention until the cut is five inches deep. The engine and cutting tools are fed downward as the cutting proceeds, and the drills can cut a channel eighteen inches in depth without unclamping or stopping the machine. There is but one clamp, or chuck, for the drills, there being no upper clamp. Thus, the drills are short and handy for use in the shop and while being changed in the cut. By a stop valve placed in the lower steam port, the blow can be regulated so that it will strike with only a light touch or with a blow of 3,000 pounds in force. As the machine is light in weight, and occupies but little space, it can be used in a chamber where the distance between the floor and the roof is but six feet.

The boiler is of an improved design, made specially for the purpose, with submerged flues, and has a water tank attached, from which the boiler is fed by means of an injector.

The efficiency and stability of this apparatus have been sufficiently tested and demonstrated by work in all kinds of stone. It has been most successfully used by the Vermont Marble Co., of West Rutland, Vt.; the Green Serpentine Marble Co., of Conowingo, Md.; by the Atlantic Stone Co., of La Grange, Ohio; and at many other well known quarries. The average capacity of the machine in various kinds of stone is given as follows: In marble, 80 to 100 square feet of channel cut in 10 hours; in limestone, 120 to 150 square feet; in sandstones, 150 to 200 square feet; in granite, 40 to 60 square feet. The machine has already made a record of 260 square feet in sandstone and 230 feet in limestone in a day of 10 hours.



THE INGERSOLL STONE CHANNELING MACHINE.

A Fourteen Inch Type Writer.

Messrs. Wyckoff, Seamans & Benedict, exclusive dealers in Remington standard type writers, etc., 339 Broadway, have lately brought out a new machine, which takes paper fourteen inches in width, and any length from a few inches to a continuous roll, while its keyboard is but a trifle larger than that of the Standard No. 2 machine. It has 42 keys, writing 84 characters—caps, small letters, punctuation marks, etc.

This machine is more particularly adapted to the wants of the legal fraternity, insurance officers, real estate men, etc., and wherever an unusual width of paper or blanks is in use.

Orders are already being received for this machine from the legal profession in England, where, by act of Parliament, certain documents and most legal papers are required to be written upon paper of extraordinary width, commonly known on the other side as brief paper.

Old Fashioned Journalism.

He was an old New Yorker, and he talked with the precision of the printed page, says the *Turf, Field and Farm*, from which we quote: "Would you believe it? When the *Tribune* was started, it refused to publish theatrical advertisements or to chronicle the movements of players. Now it gives much space to the stage. When Mr. Bonner was pushing the *Ledger*, he bought a page in the daily, semi-weekly, and weekly *Tribune*, agreeing to pay $3,000 for it. After the advertisement had appeared in the daily, Mr. Greeley raised the objection that it would hurt the weekly, which had a very large circulation, to allow one man to occupy so much space in it. Mr. Bonner insisted that the contract should be carried out in good faith, but Mr. Greeley was obstinate, and the matter was compromised by no charge being made for the page occupied in the daily.

"When Mr. Bennett, the founder of the *Herald*, heard of the transaction, he said to his trusted lieutenant, Joe Elliott, that the *Tribune* people were foolish; that no advertiser could ask for too much space at the regular rates in the *Herald*. Mr. Elliott repeated this conversation to Mr. Bonner, and the proprietor of the *Ledger* quickly remarked, 'Tell Mr. Bennett that I will take eight pages of his paper.' As the *Herald* was an eight page journal, the advertiser put in a bid for its entire space. Mr. Bennett was equal to the emergency. He put on sixteen pages, three pages of the *Ledger* advertisement going into one half section and five into the other half. This was the first time the *Herald* ever issued a sixteen page paper, and the feat was regarded as something wonderful. How different at the present, when more than thirty-two pages are sometimes caught and folded from the press! Sam Sinclair, the publisher of the *Tribune*, lived at that time in 28th Street, near Eighth Ave. The morning that the sixteen page *Herald* came out, he took his seat in the street car and bought a copy of Mr. Bennett's paper. When he opened the first half, and saw three of the pages monopolized by the *Ledger*, a scowl came on his face, and he tossed the sheet over his shoulder through the open window. Mr. Bonner, who had got into the same car, one block higher up, was amused by Sinclair's act, and he called out: 'You have thrown away the lesser part; you will find the greater in what you have kept.' Mr. Sinclair colored to the roots of his hair, and opened the sheet and was greatly surprised to see that five of the pages were given up to the *Ledger*.

"The fact then dawned on him that he and Greeley had made a mistake in refusing to carry out the contract with Mr. Bonner for one page in the *Tribune*. The first Sunday *Herald* was issued to get rid of the left-over matter which encumbered the galleys. It was an experiment; but it brought such good results as to lead to the establishment of a regular Sunday edition of the paper. Mr. Bennett was quick to seize a point and profit by it. Now all the morning journals, including the *Tribune*, print a Sunday issue, and it is really the elaborate and most costly paper of the week. The changes in the newspaper world are marvelous to an old-timer like myself." A far-away look came into the eyes of the speaker as he uttered the last words, as if the faces of the elder Bennett, Horace Greeley, Henry J. Raymond, and other journalistic stars rose before him from the mists of the past. Then he muttered something about time moving on with remorseless tread, indifferent to change, and thrust his hands into his pockets and walked away.

AT the funeral of the late King of Spain an imposing and curious scene occurred, which, it seems, is a custom peculiar to that country. When the procession reached the monastery connected with the Escurial Palace, the Duke de Sexto, the Royal Chamberlain, knocked, and requested admittance for Alfonso. When inside the gates, the Duke unlocked the coffin and called three times in Alfonso's ear. Then, according to the ritual, he said: "There is no reply. It is true, the King is dead!" He then relocked the coffin, and broke his wand of office.

THE HOBOKEN INCLINED CABLE RAILWAY.

(*Continued from first page.*)

blocks, which are bolted to iron plates riveted in between two iron channel bars, which, while adding strength to the structure, also act as guard rails. This mode of laying the track, dispensing with the wooden ties and substituting iron for wooden guard rails, is far preferable to that of the elevated roads of this city, as it is more durable, admits more light and air, and looks better.

The structure starts from the ferry at an elevation of about 8 feet, and gradually rises until it reaches the first street, where it is 15 feet high. It then continues level for about 3,500 feet, when it begins to rise at the rate of 5 feet in the hundred. There are two curves in the road, one at the ferry and the other at the foot of the steep grade.

The cable is of steel, 1½ inches in diameter, and the total length is about 2½ miles. The motive power is situated on top of the hill. There are four return-flue steel boilers, each of 125 horse power. There are two Corliss engines, having cylinders 30 inches in diameter and 5 feet stroke. The main shaft is 15 inches thick. The engines are so arranged that they can be used either singly or together. The flywheels are 20¾ feet in diameter, and each weighs 28 tons. The gearing for driving the cable drums—shown in Fig. 2—is similar to that illustrated in our article describing the Tenth Avenue Cable Railway, of this city, in the SCIENTIFIC AMERICAN of January 30, 1886, and was built by Messrs. Poole & Hunt, of Baltimore.

The arrangement and construction of the grips and rope lifters, Fig. 4, present many advantages over the old methods. The grips are not fastened to the body of the car, but to the wheel trucks, enabling the car to pass easily around the curves, and causing the grip to remain at the same distance from the cable, whether the car is loaded or not. There is one grip on each of the two trucks of the car. The grips are of iron, 3 feet long, and the cable is in contact with the jaws of the grip for the entire 3 feet. The grip is opened and closed by the turning of a hand wheel on the platform. A worm gear and set of levers, forming a powerful and positive movement, transmit the motion of the hand wheel to the jaws of the grip. In front and in the rear of each grip are two claws which can be opened and closed, lowered and raised, by means of a lever on the platform to the left of the grip wheel, and which enables the grip man to pick up the rope without the aid of any other person, and at any place on the road, level or inclined, at or between stations.

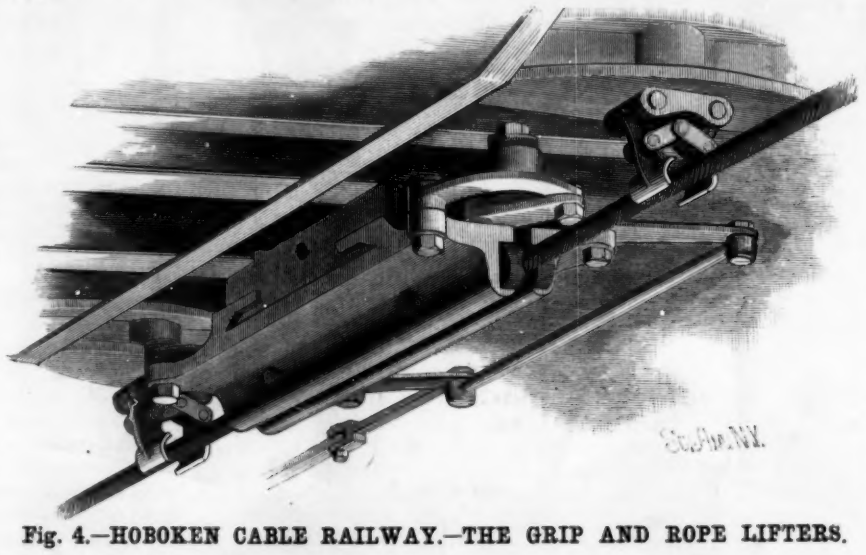


Fig. 4.—HOBOKEN CABLE RAILWAY.—THE GRIP AND ROPE LIFTERS.

The cars have the ordinary brakes to check the wheels. These brakes are tightened and loosened by the same wheel and worm gear which tightens and loosens the grip. A movement of a lever to the right of the hand wheel throws the brake into gear, and at the same time the grip out of gear, and *vice versa*, making it impossible to have the two forces (grip and brake power) operating against one another. In addition to the ordinary brakes, there are so-called track brakes, to be used in case of emergency on the incline and when the rails are slippery. Their shoes are about 2 feet long, are surfaced with wood, and can be pressed down with much force on the rough iron guard rails on each side of the track rails. By their action the car can be stopped anywhere on the incline or level, and in all kinds of weather. The construction of these brakes will be understood from the cross-sectional view, Fig. 3.

The loading and unloading of passengers at the ferry is quickly done, and without confusion. Near the terminus the down-track runs by a switch into the up-track, so that only one track enters the station. The down-cable continues, of course, in a straight direction, and leaves the down-track; it passes to the end of the station below the platform and around a large sheave, and then returns on the up-track. The single track in the station is flanked on each side by a wide platform. When a car arrives, it comes in by momentum, having let go of the cable some 700 or 800 feet before reaching the station. The passengers pass out of the car to the right and by the front door, and at the same time passengers enter the car from the left and by the rear door. Where the car stops to let out the passengers it remains until it has taken in passengers again, and is ready to start. One minute is sufficient to unload and load one car, or several if coupled together. The up cable is right underneath the car; the grip man lowers the rope lifter, raises the cable between the open jaws of the grip, closes them gradually, and the car moves off.

The advantages of this system are apparent: The incoming and outgoing passengers are completely separated from each other while in the station; only space enough for the single track is taken up within the station, thus leaving ample platform room at either side; and as the loading and unloading go on simultaneously, no time is lost. Possibly some such system could be applied to the termini of the Brooklyn Bridge, where the shifting of cars from track to track is now slowly performed by engines.

How to Strengthen the Memory.

Dr. Holbrook, in his February number of the *Herald of Health*, says there one feature of the memory which has not before been considered, and that is its exaltation in some forms of disease.

An exaltation is where a multitude of recollections spring up involuntarily on every hand. It has its cause in an increase of the circulation of the blood in the brain. It frequently appears in acute diseases, especially fevers. It is common in maniacal patients, and it sometimes appears as a feature of hysteria and in the early stages of brain diseases.

This subject of exaltation of memory will be best understood by some simple illustrations. There have been many accounts of persons saved from imminent death by drowning who all agree that at the moment of asphyxia they seemed to see their entire lives unrolled before them, even to the minutest detail. Some go so far as to say that every instance of former life seems to flash across the memory, not as an outline merely, but with every detail filled in with the most remarkable minutia—every act of life, whether right or wrong, comes back with great vividness. Ribot cites the case of a clear-headed man who was in the act of crossing a railroad track when an express train running at full speed appeared close at hand. The man had barely time to throw himself down in the center of the road, between the two lines of rails; and as the train rushed over him, the feeling of impending danger brought to his recollection most vividly every act and incident of his former life in such an array as to suggest to him the opening of "the great book at the last great day."

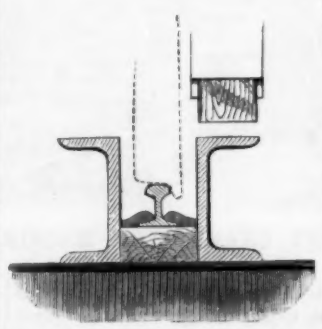


Fig. 3.—SECTION THROUGH TRACK.

There is no doubt much exaggeration in these statements; yet they show an enormous temporary increase or exaltation of the natural memory.

De Quincey, in his "Confessions of an English Opium Eater," gives an experience which shows how the memory may be exalted by intoxication by the use of opium. He says: "Sometimes I seemed to have lived from 70 to 100 years in a single night. The minutest incidents of childhood or forgotten scenes of later years were often revived. I could not be said to recollect them, for if I had been told of them on awakening, I should not have been able to acknowledge them as a part of my experience; but placed before me in dream like intuitions, and clothed in all their evanescent circumstances and accompanying feelings, I recognized them instantly."

Such augmentations of the memory may be regarded as abnormal and undesirable, being indications of disease; but they teach one lesson to those who would strengthen their memories, and that is the value and necessity of a perfectly healthy and vigorous circulation of blood in the brain. The same lesson is taught by an opposite condition from that of an exaltation—a diminution of the normal memory by a decay or withering of the brain cells and a diminished supply of blood to the parts.

The loss of memory in the aged is a familiar example, and can only be accounted for by a deterioration of the brain elements and a diminution of blood supplied to them. One of the worst features of such cases is the fact that an old person is not, for a long time after decay has begun, aware of it. I am now treating a case of loss of memory in a person advanced in years, who did not know that his memory had failed most remarkably till I told him of it. He is making vigorous effort to bring it back again, and with partial success.

The method pursued is to spend two hours daily, one in the morning and one in the evening, in exercising this faculty. The patient is instructed to give the closest attention to all that he learns, so that it shall be impressed on the mind clearly. He is asked to recall every evening all the facts and experiences of the day, and again the next morning. Every name heard is written down and impressed on his mind clearly, and an effort made to recall it at intervals. Ten names from among public men are ordered to be committed to memory every week. A verse of poetry is to be learned, also a verse from the Bible, daily. He is asked to remember the number of the page in any book where any interesting fact is recorded. These and other methods are slowly resuscitating a failing memory.

The aged should all look to this danger in their lives, and resolve to combat it from the very first. By so doing they will make their declining years more enjoyable, and give much greater pleasure to their friends. Unceasing self-culture, especially in preserving the memory and intellectual faculties, should constitute a considerable part of the life of every aged person, even more than of the young. Only by it can this period of life be rendered pleasant and profitable.

Hints to Architects.

Notwithstanding the wide disparity of climatic conditions between this country and Japan, a perusal of Prof. E. S. Morse's recent book on "Japanese Homes," now in its second edition, the first having been exhausted in ten days, will reveal much of interest and value to our own builders.

The principles of Japanese decorative design have made steady progress among us since the Centennial Exposition, at Philadelphia. A characteristic feature is the universal adoption of the natural wood finish for inventors. A serious impediment to the general use of natural wood among us arises from the difficulty of matching the grain of different boards as they are furnished at the lumber yard. The simple precaution of tying up in bundles the sawn boards from each log by itself is there universal, and solves this difficulty.

Should not that be considered in some respects a happy country where scaffolds never fall, precipitating workmen to death or disaster? Yet this desideratum is attained by firmly binding together the structure with stout cords instead of using nails, the frequent use of which constantly weakens the materials employed.

Prof. Morse is most enthusiastic in eulogizing the artistic instincts of the Japanese, and considers it remarkable that a people with so few noteworthy public buildings should have so far surpassed ourselves in solving the problem of comfortable homes.

A Wrong Use of the Bible.

In all court houses in New York, very dirty copies of the Bible are used in a way which, the editor of the *Herald of Health* thinks, and in which almost every one will concur, is dangerous to health. When jurors or witnesses are sworn, they are expected to take the Bible in one hand, and after repeating the oath, to kiss the book with their lips. Clean and unclean people do this indiscriminately, and it does not take long to make the cover, and even the leaves, of this book very foul. Such a use of it, it seems to us, is unwarrantable.

The Bible says: "Swear not at all; neither by the heaven, for it is the throne of God; nor by the earth, for it is the footstool of his feet; nor by Jerusalem, for it is the city of the great King. Neither shalt thou swear by thy head, for thou canst not make one hair white or black. But let your speech be, Yea, yea; Nay, nay: and whatsoever is more than these cometh of the evil one."

Cleanly people, who do not wish to kiss a book sodden with grease and foul with filth, are allowed to affirm, which is certainly preferable. Others practice a harmless sort of evasion, by holding the book in such a way that they can kiss their thumbs without being observed by the officer of the court, who, by the way, is rarely very watchful, and is satisfied if one goes through with the form rather than the spirit of the oath.

Correspondence.

Preserving Wood Ties.

To the Editor of the Scientific American:

Get good heart timber and season well, then dip in a vat of hot linseed oil and charcoal dust, mixed to the consistency of paint. This will fill all the cracks, etc., and preserve the tie for from 25 to 100 years. I have known posts treated in this way to last 20 years, and they are good yet. F. M. SHIELDS.

Coopwood, Miss., Jan. 22, 1886.

Indelible Marking Ink.

To the Editor of the Scientific American:

I am reminded by a recipe for marking or indelible ink in the SCIENTIFIC AMERICAN for Dec. 26 to call your attention to, for such purpose, the common Chinese or India ink, such as comes in flat sticks, usually gilded, and largely used by draughtsmen.

The Chinese laundrymen mark clothes with this, and my Chinese servant assures me that it is indelible. In consequence of this assurance, I marked some handkerchiefs with Chinese ink (which I bought in Canton, in 1851), about three months ago. Thus far, after repeated washings, the marks continue to be black and, apparently, indelible. GEO. S. J. OLIVER.

Santa Barbara, Cal., Jan. 21, 1886.

From One of Our Oldest Subscribers.

To the Editor of the Scientific American:

Forty years have come and gone since I first became acquainted with the SCIENTIFIC AMERICAN, and during the whole of that time we have had a weekly chat together, except from 1849 to 1851, while I was in California, and during the years of our domestic troubles—1861 to 1865.

During this time I have not neglected the church, going to hear and learn from our newest and best preachers, and with many of them have very friendly and social intercourse; but I must say that I have derived more information, more insight to nature, more elevating thoughts, a better familiarity with God through his works, a higher standard of morality, and more pleasure from the SCIENTIFIC AMERICAN than from all other sources together. No visitor is more welcome, and none more missed.

Ten years more, and we will have the "golden wedding." Won't that be a glorious day? Ten years more! *Will we both* be in existence then? With all our *scientific* knowledge, and SUPPLEMENT to boot, who can tell? I am on the verge of my allotted time, three score and ten; perhaps your are as near; if so, the chances for a golden wedding are against us. But while the lamp holds out to burn, I will try and be a reader. So I inclose my $3.20 for another year.

J. R. MAYBEN.

Lynchburg, Va., Jan. 1, 1886.

The Atlantic Right Whale.

To the Editor of the Scientific American:

In your issue of October 17, 1885, W. O. A. reviews the article on "The Atlantic Right Whale," published in SCIENTIFIC AMERICAN, August 8, 1885. His statements would not readily have met with question twenty years since, but in the light of present knowledge he is questioning true record. I have not statistics at hand, but the more important point I wish to make is that your correspondent is in error concerning the species of right whale.

The figure in SCIENTIFIC AMERICAN of August 8 is a tolerably correct one of the Atlantic right whale (*Balæna cisarctica*, Cope), and is therefore not, as he supposes, the more familiar Arctic right whale (*Balæna mysticetus*, Linn.).

From the early settlement of America to about the time of our separation from the mother country, the "black whale," then without systematic name in America, but since known to be the "nordcaper" and "sletback" of the Icelanders, and later the Biscay whale (*Balæna biscayensis*) of European writers, was rather abundant in the North Atlantic. Our forefathers found the Indians capturing it from the shores; and the whites long pursued it in nothing more substantial than common rowboats.

During the last quarter of the eighteenth century this whale became so scarce that it was not often found on our coast; and eventually, after larger vessels were used and long cruises were made, the "fishery" was given up. The revolutionary war was also a potent element in breaking up our whaling fleet.

About this time the Arctic right whale (*B. mysticetus*), called also "bow head," etc., was discovered; or rather, the few whalers left at this time sought further north and came upon this whale, supposing it to be the same as the nordcaper, but a fatter, larger whale, with longer "whalebone," or baleen, not discerning the very marked difference. The North Atlantic right whale (*B. cisarctica*) remained extinct, as was supposed, until 1854, when a female and young were seen in the Bay of Biscay. The cub only was secured; and served for a time as the only example by which the characters of the species could be studied from the actual specimen. Its immature age, however, rendered it of little value, beyond certain points.

In 1865, Prof. Cope brought the subject into shape after examining a specimen that came ashore in Delaware Bay. It was not, however, full grown, and certain features, particularly the external ones, were not observed.

It was in the spring of 1882 that the first opportunity occurred to examine the full grown (a female) Atlantic right whale, the species having been nearly extinct during the period commencing about the year 1770. The next was a male, taken in Charleston, S. C., Harbor in 1880, the skeleton of which is in the Museum of the Charleston Medical College.

Since then, during the winter of 1884, several examples have appeared. Six were seen off Amagansett, Long Island, and four were secured.

The American Museum of Natural History has long had a skeleton of this species—an adult male, about 40 feet in length. Its history is obscure, excepting that it came ashore more than sixteen years since on Long Island.

Two or three more of this species have been captured this year off Amagansett, Long Island. Singularly enough, Captain Josh. Edwards has in all these instances of recent capture been the operator. From a long period of supposed extinction, this whale is now evidently becoming more numerous. With one exception, all that have been seen were off Long Island shores.

For further items of interest concerning this whale, the reader is referred to Bulletin No. 4, American Museum of Natural History, Central Park.

J. B. HOLDER.

Regular Ice Formation.

To the Editor of the Scientific American:

About ten years ago I saw a peculiar ice formation in the little creek called "Camp Run," in Stark Co., Ill.; and not having seen or heard of anything like it elsewhere, I deem it worthy of being put on record. It consisted of a perfect circle of ice, whirling on an eddy formed by a bend in the stream and held in position by the shore ice, which nearly incircled it. All the ice was formed on the preceding night, and was about three-eighths of an inch thick. The circle was nearly four feet in diameter, and both it and the incircling ice, as far as it went, were so perfect and fitted so close that a lead pencil could not be inserted between them anywhere without forcing. The circle was making a revolution in about twenty seconds, and the grinding had produced two moraines of ice about half an inch high; one on the shore ice, which extended as far around the circle as the ice did, and the other on the circle, around which it formed a continuous margin. The phenomenon was in constant operation till the middle of the afternoon, when an incautious visitor stepped so near the shore that he loosened the ice, and the whole affair floated away and broke up.

If a similar instance is known elsewhere, I should be glad to hear it, and also an explanation of its formation. My first supposition was that a piece of floating ice had been caught by the eddy, and the whirling motion had ground off the projections of both it and the forming shore ice, while allowing the interstices to fill up; but such a formation would have been indicated by the appearance of the circle and by the variation in size of the moraines on the parts that were formerly projections and hollows. There was no such indication, however, so I think some other explanation necessary. CHAS. E. DURYEA.

Peoria, Ill.

A Practical Remedy for Anchor Ice.

To the Editor of the Scientific American:

Your editorial in SCIENTIFIC AMERICAN for this week, concerning the "Stoppage of the Cleveland Water Tunnel by Ice Spicules," leads me to send you the present communication, as a means of pointing out a simple and efficient remedy for all such difficulties. If any credit is due for discovering this sure avoidance of trouble from anchor ice, that will be ample compensation for the time it requires to make it public in the present communication; and all those suffering from its annoyances are welcome to the remedy. There is no patent to prevent their using it. These works—the Fall River Bleachery—have a present capacity, now being run to its utmost, for bleaching over 18 tons of cloth a day. In the various processes an enormous water supply is needed, and this is furnished by two pipes, one of 16 inches diameter, the other 10 inches, both under 8 feet head. That the water may be absolutely pure, there was built over the inlet of each pipe, in the pond, a brick filter, through which all water has to pass. From the commencement of our business, 13 years ago, until we found a remedy, we were troubled every winter by anchor ice, which, many a day, made it impossible for us to get any water till nearly noon. I noticed, however, that after a good coating of ice formed on the pond, we never were troubled by anchor ice. It seemed as if the ice field prevented the zero temperature from drawing down through the water coming into the filter, freezing it into the ice spicules, which choke everything.

This operation proved a complete solution of the entire difficulty. For several years I have had a raft made of ordinary spruce boards, floated over my filters in the fall, anchored at its four corners, and there it remains, freezing in, until released by the warm weather the next spring.

Now, if the Cleveland Water Board, or any one else troubled with anchor ice, will float a raft of sufficient area over the inlet of the water supply, their experience will verify my statement. They will never again suffer from anchor ice.

SPENCER BORDEN.

Fall River Bleachery, Fall River, Mass., Feb. 5, 1886.

Will Steam Pipes Set Wood on Fire?

To the Editor of the Scientific American:

I have read the recent articles in your valuable paper on "The Firing of Wood by Contact with Steam Pipes," and am greatly interested in the subject, having the charge of a large institution, filled with helpless people, where all the heating is done by steam. The question whether wood can be ignited by the heat from steam pipes does not seem as yet to have been settled by your correspondents.

It has been my experience to observe, for a period of twenty-five years, wood in contact with steam pipes, carrying a pressure of from one to fifty pounds, and I have never observed the least charring from such contact. For a year past we have had some steam coils in contact with Southern or hard pine; the pitch or resin has run on the heated pipes and dropped to the ground, where it has been gathered up by the handful, and still no appearance of charring. I am therefore led to conclude wood cannot be set on fire by the heat of steam pipes at ordinary pressure, or say at a pressure not exceeding fifty pounds.

In regard to the firing of hemp mentioned by one of your correspondents, on being exposed to the air, may not the oil this packing was saturated with, to a greater or less extent, play some part in this combustion? Besides, to fall back on my experience again, free steam will char and perhaps fire wood under favorable conditions.

Some years ago we had a four-inch steam pipe and a two and a half inch hot water pipe and a two and a half inch condense steam pipe, running through a passage from the main building to our boiler house, a distance of two hundred and sixty feet. To prevent the loss of radiation from this steam pipe, we made a box from ten to twelve inches square, and nailed cleats on the edges of two of the boards of this box and secured them by wood clamps on the outside, so, in case of leakage, we could readily take the box apart by simply removing these clamps.

In the course of a year or two this steam pipe leaked, and the box was taken apart to repair it. To our surprise, in the immediate vicinity of this leak this box was extensively charred. I send you with this a piece of wood taken from this box and a part of one of the cleats before mentioned.

Now, as the box was ten or twelve inches square, and contained only one four-inch steam pipe, it could not have been in contact with this piece of wood in one corner of the box, and probably was several inches from it. So I say free steam in a confined space will fire wood, and present the inclosed as a proof of this assertion. H. F. CARRIEL, M.D., Supt.

The Illinois Central Hospital for the Insane,
Jacksonville, Ill., Feb. 2, 1886.

[We have received the specimen, which is a thoroughly charred piece of pine. Looks as if it had been on fire.—EDS.]

Fire from Steam Pipes.

The Pittsburg *Leader*, Feb. 4, says: "This morning the Petroleum Exchange was found to be on fire. This is the second time the elegant structure has been threatened with destruction from fire within the past two months. The wainscoting, mantel, and marble slabs, carpet, etc., introduced to beautify the interior, were destroyed, and the loss will probably exceed $500, and which is fully covered by insurance. The fire on this as well as the former occasion is attributed to defective plumbing, the steam pipes having been so introduced as to allow the flooring to rest directly on them. In places the boards are completely charred by the heat of the pipes."

The Fastest Steam Craft in the World.

A new torpedo boat recently built at London, by Yarrow & Co., has attained the remarkable speed of 24·027 knots, or 27·66 miles, per hour. This is believed to be the fastest time ever reached by any steam vessel.

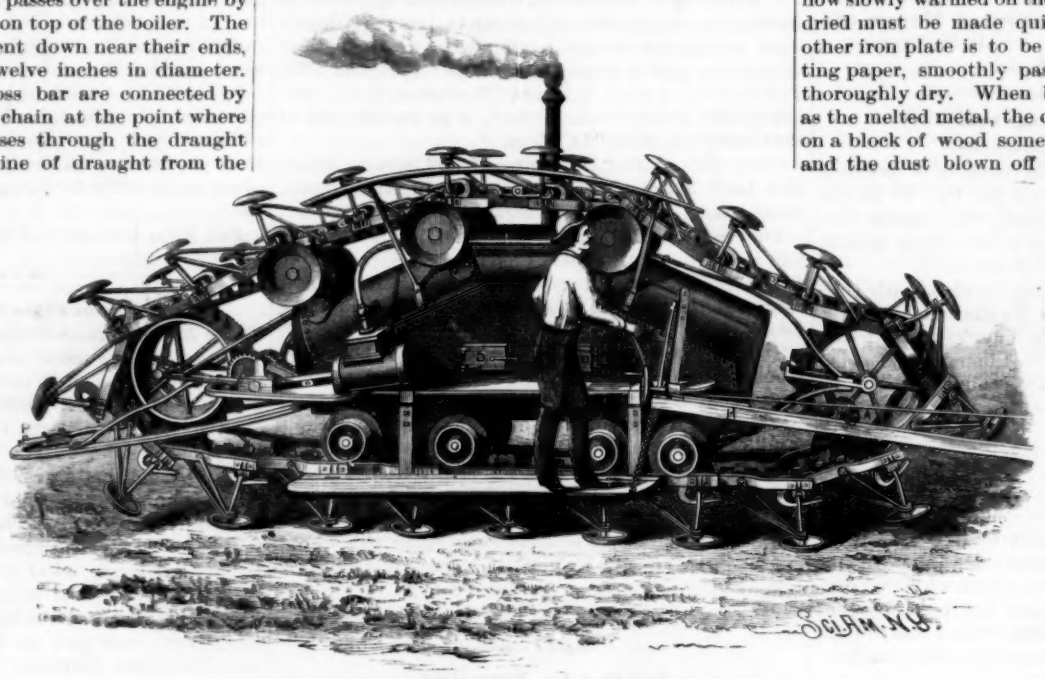
AN IMPROVED FARM LOCOMOTIVE.

The novel locomotive herewith illustrated carries and lays its own track, which consists of an endless chain passing around two sprocket wheels, one at each end of the locomotive, feet for resting upon the ground, and jointed side rail sections forming the track, which is laid down in front of the engine and picked up in the rear, and which supports the truck wheels of the engine, and is supported as it passes over the engine by flanged guide wheels placed on top of the boiler. The cross bars of the chain are bent down near their ends, and provided with plates twelve inches in diameter. The lower ends of each cross bar are connected by braces to the center driving chain at the point where the preceding cross bar passes through the draught chain. This gives a direct line of draught from the lower part of the rear sprocket wheel to the feet, which are pressed firmly on the ground by the weight of the engine.

The rear sprocket wheel is driven by a suitably arranged steam engine. There is a certain amount of play between the links of the track chains, so as to allow the track to be laid in a curve. The front sprocket wheel is hung in a swiveled frame, so as to lay the track to the right or left; the locomotive may be turned in a radius of twenty feet.

The steering beam, H, is connected with the swiveled frame, and at its forward end are carried two wheels, set at an angle, so as to run against the sides of the last made furrow and automatically steer the engine. When there is no furrow, the pilot is supplied with a rolling colter hung in the pilot frame in such a manner that it can be lowered to steer with. This device can be set so as to steer the engine with great precision.

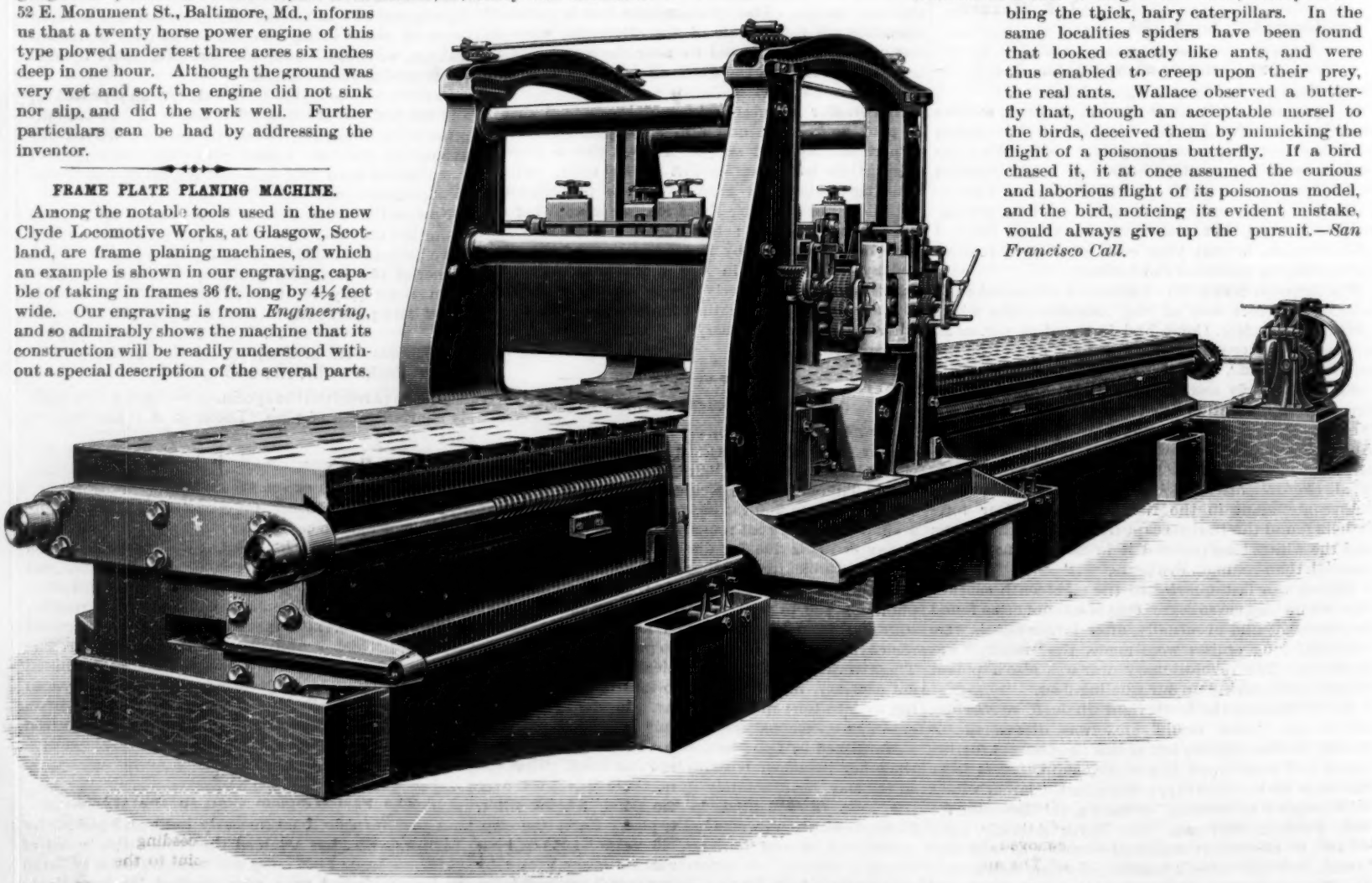
The boiler consists of two cylinders, filled with tubes, and set at an angle, to prevent the burning of the tubes when the engine is going up hill. The cylinders are connected together by water legs, which form the main frame of the engine. On the opposite side of the engine from where the engineer stands is a condenser, the water from which is returned to the boiler. When on the road, the steering beam is removed and the engine is steered by a hand lever within easy reach of the engineer. One man can manage the locomotive and a gang of ten plows. The inventor, Mr. B. S. Benson, of 52 E. Monument St., Baltimore, Md., informs us that a twenty horse power engine of this type plowed under test three acres six inches deep in one hour. Although the ground was very wet and soft, the engine did not sink nor slip, and did the work well. Further particulars can be had by addressing the inventor.



BENSON'S IMPROVED FARM LOCOMOTIVE.

FRAME PLATE PLANING MACHINE.

Among the notable tools used in the new Clyde Locomotive Works, at Glasgow, Scotland, are frame planing machines, of which an example is shown in our engraving, capable of taking in frames 36 ft. long by 4½ feet wide. Our engraving is from *Engineering*, and so admirably shows the machine that its construction will be readily understood without a special description of the several parts. The Clyde Works, including tools, engines, and buildings, are new throughout, and contain many specimens of splendid machinery with the most recent improvements.



IMPROVED FRAME PLATE PLANING MACHINE.

Stereotyping for Amateurs.

Procure two cast iron plates, say 8 x 10 inches and half inch thick. One side of each plate must be planed dead flat and smooth. To prepare the matrix, the woodcut or electrotype must be well oiled on the face and edges. This is best done by using an old tooth brush and rubbing the oil into the finest lines, but avoiding any excess. Now mix the finest plaster of Paris and water to the consistency of cream, and spread it on the engraved surface of the block with a spatula or putty knife, pressing it well into the lines. At the same time pour about a tablespoonful of the plaster on one of the iron plates and quickly press the block, face down, into the pool of plaster, as deep as possible. If the pressure is sufficient, the still liquid plaster will be squeezed out on all sides and forced into the lines of the engraving at the same time. The surplus showing around the block is now cleared away with the spatula and a rag, while the block is held steady with one hand.

In ten or fifteen minutes the plaster will be hard and the block may be gently lifted off, after being first started by a few slight blows with the handle of the spatula or other light instrument. If properly done, the plaster will be a thin film, not more than one thirty-second inch thick, firmly adhering to the iron plate and having a very sharp impression of the engraving on the upper surface. The plate bearing the matrix is now slowly warmed on the stove, and when thoroughly dried must be made quite hot before casting. The other iron plate is to be covered with a sheet of blotting paper, smoothly pasted on with flour paste and thoroughly dry. When both plates are almost as hot as the melted metal, the one bearing the matrix is laid on a block of wood somewhat smaller than the plate, and the dust blown off with the breath. The other plate is now laid exactly over the first one, but is prevented from touching the matrix by a piece of wire bent in the shape of the letter U, and previously laid on the plate and surrounding the matrix on three sides.

The two plates are now to be tightly clamped together with four or six small iron clamps.

The mould is now ready for casting the stereotype plate, and the plates are turned upright, with the open end uppermost, and the molten metal poured in from a ladle. Ordinary stereotype metal or old type melted down is used for making the plates. The operations described should produce a sharp, clean printing plate, ready to be blocked type high, after first being made square with a saw.

Being cast between parallel iron plates, the stereotype will be flat and true on the back, and requires no subsequent shaving to make it level. The method of making the plaster matrix insures a sharp impression, and its thinness insures quick drying and making ready for pouring in the metal. The papier-maché process cannot compare with this for fine results.

T. C. HARRIS.

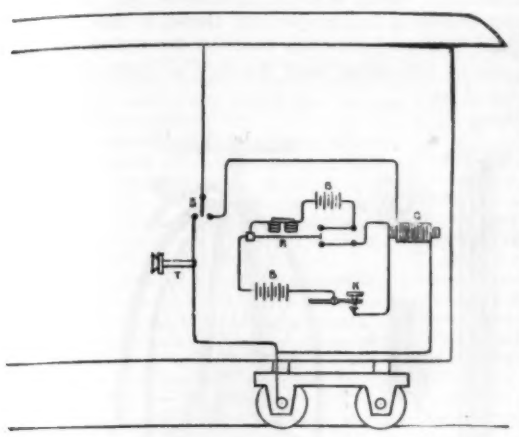
Singular Deception by Butterflies.

It is well known that birds do not especially care for hairy butterflies. So, in Central America, Belt found a curious beetle, that was a tidbit for the birds, clothed in a coat of long brown hairs, closely resembling the thick, hairy caterpillars. In the same localities spiders have been found that looked exactly like ants, and were thus enabled to creep upon their prey, the real ants. Wallace observed a butterfly that, though an acceptable morsel to the birds, deceived them by mimicking the flight of a poisonous butterfly. If a bird chased it, it at once assumed the curious and laborious flight of its poisonous model, and the bird, noticing its evident mistake, would always give up the pursuit.—*San Francisco Call.*

THE EDISON SYSTEM OF RAILWAY TELEGRAPHY.

The announcement made last summer that Mr. Thomas A. Edison was working out the details of a system of inductive telegraphy for sending and receiving messages on moving trains prepared the public for taking a very lively interest in the week's practical trial of the system, recently made on the Staten Island Railway. The necessary apparatus was applied to a car on one of the regular afternoon trains running from Clifton to Tottenville. The experiments were made personally interesting by having each member of the party leave a written message, sealed

FIG. 1.



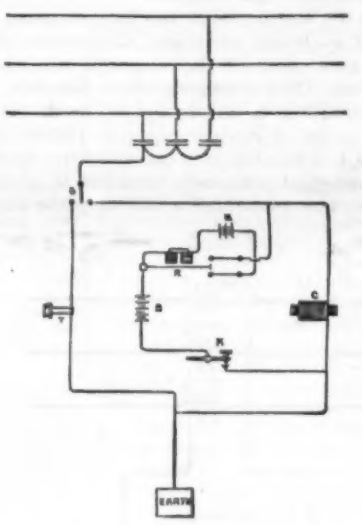
and directed to himself, with the operator at Clifton. During the trip, these messages were received on board the moving train, and each writer had the satisfaction of having his words correctly returned to him.

The main feature of the system, that of using the ordinary telegraph wires strung on the poles along the track, in place of a specially laid wire, as in the Phelps system, was invented and patented by Mr. William Wiley Smith in the fall of 1881, and he and Mr. E. T. Gilliland have been associated with Mr. Edison in the development of this idea.

The apparatus on board the train is all attached to tion coil, and a battery. Similar apparatus is in use at the fixed stations. With the assistance of our diagrammatic illustrations, the reader will be able to understand the disposition of the instruments, and follow the current on its journey from the key on the train to the receiver at the fixed station, or *vice versa*. The car roofs are covered with tin and connected electrically by copper wire. During the experimental run at Staten Island, four cars were used. As the induction takes place between the telegraph wires and the tin roof, it is desirable to have as large a metallic surface as possible. Under favorable conditions, one roof will suffice, but it is better to have several. An insulated wire runs from the roof of the telegraphing car to a switch, S, at the operator's desk. This is shown open in Fig. 1. When a message is to be received on the car, the switch is turned to connect with a wire running to the phonetic receiver, T, and thence to the ground. The receiver may be either an ordinary telephone, or a pair may be used and held to the ears, somewhat after the manner of ear muffs. After coming from receiver, the wire is carried under the car and connected with a strip of copper, which is pressed against a copper cylinder on one of the axles by means of a spring, thus giving a ground connection by the axle and wheel.

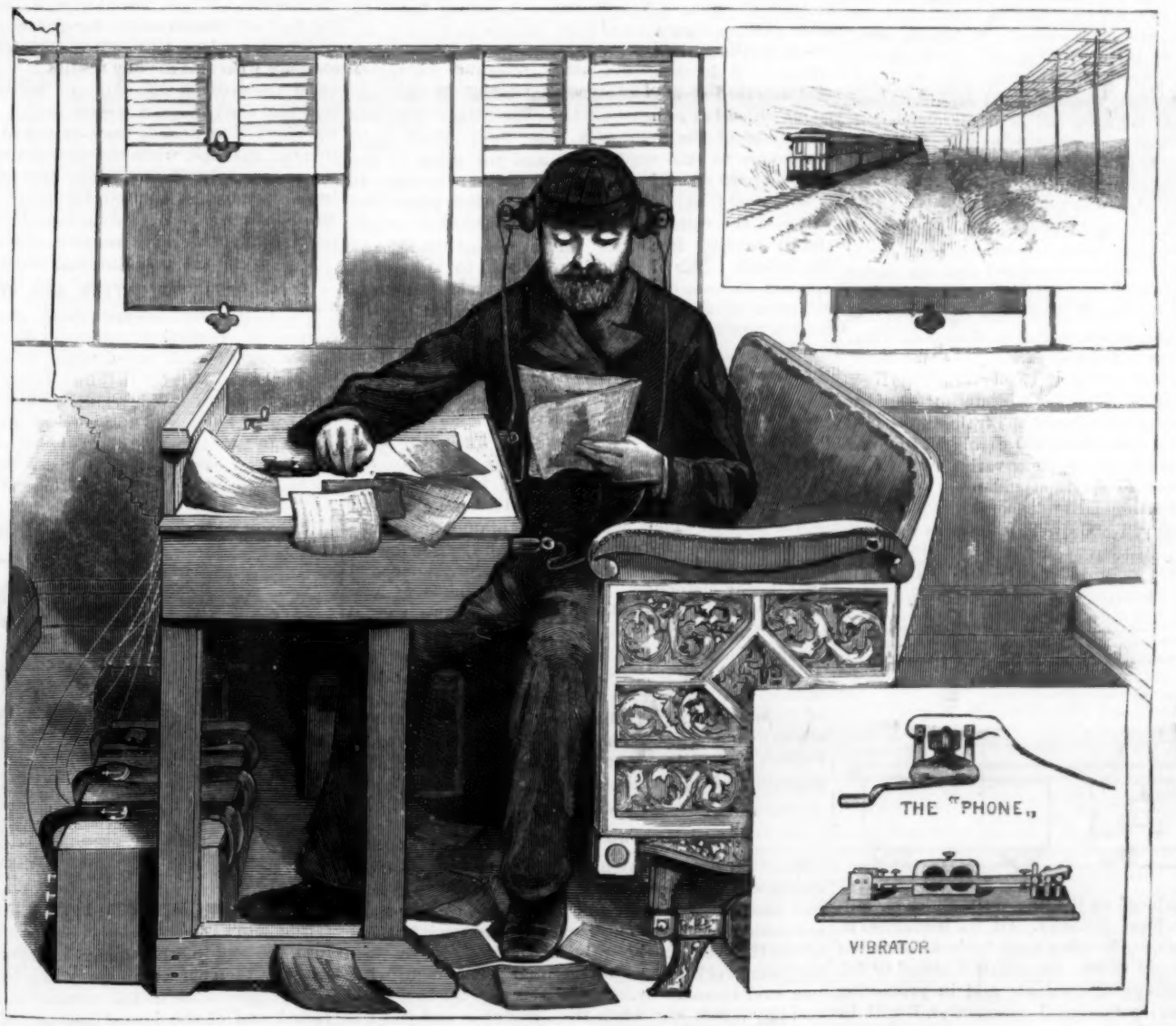
When, however, a message is to be transmitted from the car, the switch is connected with a wire leading to one end of a secondary coil at C, the other end of which is connected with the ground wire just described. Inside of this secondary coil, and separated from it by a layer of paper, is the primary coil, which is within the short electrical circuit represented by the diagram. A ten cell Fuller battery is placed underneath the desk. One pole of the battery is connected with the Morse key, K, which in turn is connected with one end of the primary coil as shown. The other pole of the battery is connected with a metallic reed, R, which is made to vibrate 500 times a second by means of a small independent battery. These vibrations produce a sharp, clear musical note, which is very audible at short distances from the operator's desk. The free end of the reed at each vibration strikes against a metallic button, connected by a wire with the other end of the primary coil. This being the arrangement of the apparatus on the train, we will suppose that the message

FIG. 2.



hundred waves, and these electrical waves induce corresponding ones in the secondary coil. The function of this induction coil is to transform the intermittent current into one of high electrical tension. From the coil the waves pass to the roof, and by a sharp, quick discharge traverse the intervening air and reach the telegraph wires. It will be noticed that the word "discharge" is employed in spite of the fact that the action between the roof and wires is nevertheless, in strict electrical parlance, one of induction. This constitutes the point of the invention.

Mr. Edison believes that he has made a new discovery in physics. He finds that bodies hitherto considered non-conductors, such as air, are really so only after an appreciable period of time. At the first instant of discharge, the air offers no resistance to the passage of a current, but becomes almost immediately polarized, and the communication becomes permanently interrupted. The idea, therefore, in these very short waves of high tension is to permit them to cross to the wires before the air has time to offer any oppo-



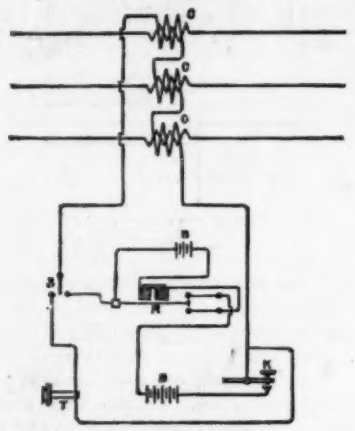
THE EDISON SYSTEM OF RAILWAY TELEGRAPHY.

a compact operator's desk, occupying no more room than an ordinary car seat. This desk may be placed in any part of the car desired, and may be moved from one car to another in a few minutes' time. The apparatus consists of an ordinary Morse key, phonetic receivers, an electro-magnet, a vibrating reed, an induc- is actually being transmitted. The Morse alphabet of dash and dot is employed, and consequently any operator can work the system. When the key is pressed down to form a letter, the short circuit is closed and the current passes through the primary coil. But the vibrating reed breaks the current each second into five sition. A sufficient period, however, intervenes between them to permit the air to return to its normal condition, and consequently allow the succeeding waves to pass. Mr. Edison illustrated this point to the writer by drawing a series of dots about an inch apart. The dots represent the waves and the spaces the interven-

ing air. The polarization of the air attendant upon the passage of the waves is neutralized before the arrival of the wave following. The series of waves, having been communicated to the telegraph wires, are transmitted to every station on the line and to every train having suitable apparatus. If the key were held down continuously, simply a musical note, corresponding to that produced by the vibrating reed, would be heard in all the receivers. It is the breaking up of this note into dots and dashes, by means of the key, that transmits the telegram.

Though the apparatus at the fixed stations is similar to that on board the trains, the manner of throwing the waves on or off the telegraph wires is naturally different. Two arrangements are possible. In the one shown in Fig. 2, condensers are used. These are simply a series of circular metallic plates, equal in number to the number of telegraph wires used. One plate is connected with each wire, and is brought opposite, but not touching, a similar plate connected

FIG. 3.

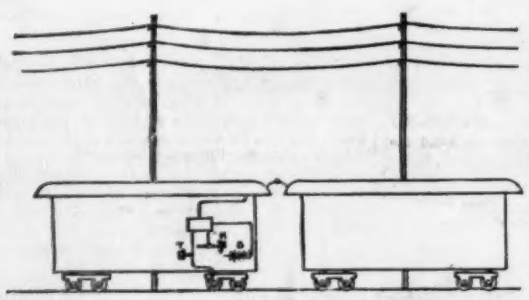


with the switch, S, in the station. The electrical waves pass to the condensers, spring across the intervening space to those opposite, and so pass on to the receivers.

In the second arrangement, shown in Fig. 3, no condensers are used, but the telegraph wires themselves are formed into a primary coil, and the wires from the office switch form the secondary coil. This is shown at C. In this case no further induction coil is needed in the office. The number of wires necessary for the transmission of the waves will depend upon circumstances. In case the sound becomes too faint for convenient translation into words, a greater number of wires should be employed. At Staten Island four were used, and gave very satisfactory results. The distance from the car roof to the wires was from 15 to 20 feet. In experiments made at Menlo Park, Mr. Edison succeeded in transmitting a message through the air over a distance of 580 feet. It will be observed that the circuit connecting the operator's key and the receiver is three times broken by the air, once at the induction coil, once at the roof, and again at the fixed station, either at the condensers or at the line coil.

As one of the chief merits of this system is its inexpensiveness, it may be of interest to state just what the cost is. The apparatus on board the train and that at the fixed stations cost about $50 each. The annual royalty for the use of the system varies from $7 per mile on roads of five to six thousand miles to $15 per mile on roads of a hundred miles or less. The president of the company, Dr. Crowell, informs us that it is

FIG. 4.



about to be introduced on the line of the Chicago, Milwaukee, and St. Paul Railway. Of its usefulness in averting accidents, by keeping each train informed of the whereabouts of the one immediately ahead or following it, in intercepting criminals, and in promoting general social and commercial intercourse, it will be unnecessary to speak.

We are indebted to *Frank Leslie's Illustrated Newspaper* for the use of the large cut.

IT is common practice, when employing chloride of calcium, to dry the air surrounding an instrument, to place the capsule on the bottom of the case. Experiment has clearly shown that desiccation is far more rapid and thorough if the salt be placed near the top.

Firing without Flame in Coal Mines.

It is announced in the *Bulletin de la Societe de l'Industrie Minerale* that some trials recently concluded at the experimental mine gallery at Neukirchen have abundantly justified the suggestion made by Mr. Galloway for the water tamping of blasting charges in fiery mines. Mr. Galloway offered the suggestion as a possible method of preventing the flame from shot firing entering the air of a mine, and causing an explosion with the fire damp and coal dust that might at the moment be present. The trials made at Neukirchen were designed to prove the value of this suggestion under the most trying conditions. A blast hole was charged with gunpowder and tamped with water, this latter being contained in animal bladder. It was fired in an atmosphere containing five per cent of fire damp, with coal dust spread over a length of ten meters of the gallery floor, without producing the slightest flame or consequent explosion.

A similar shot fired under analogous conditions with a different tamping produced a very violent explosion. The experiments were repeated with the same results. It was proved also that water tamping is quite as efficacious for practical purposes as any other; for a heavy block of bed rock was completely broken up by this means. The experiments are to be continued and varied; but this preliminary announcement has been published by the society which is carrying on the investigation, to show that a means of robbing coal mining of half its terrors, without at the same time causing the miner to work under irksome restraints and disadvantages, has at length been put into practice. There is no reason to suppose that this system of blasting—the credit for suggesting which it is pleasant to see accorded to Mr. Galloway even by the foreign society—will be one whit more troublesome than the old; and the additional expense, if any, must be insignificant.

New Facts Concerning the Venous Circulation in the Fingers.

The separate injection of minute venous radicals is a matter of difficulty, owing to the resistance offered by the valves. M. Bouceret adopts the following method: The part to be injected is kept in a warm bath, 104° to 113° Fah., for five or six hours. The arteries are then injected with a colorless fluid; as soon as the subcutaneous veins appear to be well defined, but before they are distended, the injection is stopped. A cannula is inserted by means of a trocar into the largest of the superficial veins. A simultaneous injection is next made of the artery with red fluid, and of the vein with blue fluid. Each fluid penetrates to the capillaries, and the color of the part is pretty much that which is seen in life. It is supposed that the colorless fluid either makes the valves of the veins incompetent by distention, or else that it actually forces the valves against the sides of the vessels. This method has brought to light what appears to be a discovery, which is no less than the existence of a special collateral circulation in the fingers perfectly distinct from that which nourishes the tissues. The branches which are given off from the collateral arteries are very few and thin, so that the trunk vessels are hardly reduced in size where they terminate in an arch at about the middle of the palmar aspect of the last phalanx. From the arch many arterial tufts are given off, and divide in the pulp of the finger. These vessels have no venæ comites. Practically, the tufts are like the glomeruli of the kidney. They are found in abundance about the arch before mentioned and under the upper two-thirds of the nail, as well as over the thenar and hypothenar eminences. The ordinary mode of vascularization is found side by side with this special form. The large size of the digital vessels at their termination is in great contrast with the comparatively slight nutritive wants of these parts, and M. Bouceret believes that the object of the special kind of circulation is to afford more nourishment and warmth; but there seems more probability in M. Poirer's suggestion that it is related to the exquisite sensibility of the localities concerned.—*Lancet.*

Bring up Young Men.

Some three years ago, in an editorial, we advised our manufacturers to select one or more boys from good and tried families—boys that bid well to become staid, energetic, business men. Send them to some institute where they can get the training you desire to fit them for your work. Open an account with them; when you send them away, charge the expense to them as you pay it out; and when they graduate, and you put them in the mill, give them to understand that if they prove themselves worthy of the trust, you will make them sharers of the profits. You will get a blank once in a while, but as a rule you will get young men who will help to carry your burden, while you do the thinking. And your business secrets will be kept. Besides, to have half a dozen young men coming up in this way will elevate the tone of your works. Instead of one owner going through the mill once or twice a day, there will be an owner in sight somewhere all the time. You can then use your skill and experience where it will produce the most money.—*Wade's Fibre and Fabric.*

BICYCLE LEG.

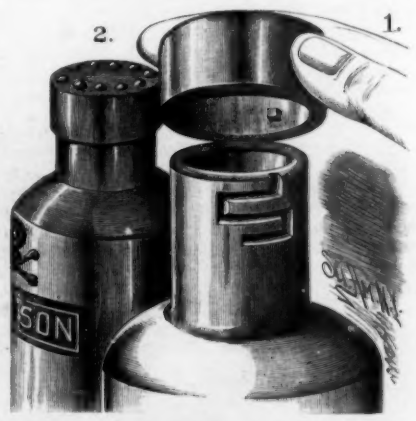
The annexed engraving shows a simple device—the invention of Mr. John F. Morgan, of 82 Munroe Street, Lynn, Mass.—for holding the bicycle erect when it is at a standstill. On each shank of the fork is secured a tubular casing, Figs. 2 and 3, closed at the top by a loose cap. At the outer side part of each casing is a longitudinal slot, having a notch at its lower end extending toward the rear, as indicated in Fig. 4. Within the casing is a sliding tubular leg extension, formed with a lug projecting through the slot. A square rod projects from the cap down through the center of the casing and through a square aperture

MORGAN'S BICYCLE LEG.

in the top of the sliding leg. Surrounding the rod is a spring which usually keeps the leg raised within the casing. When the bicycle is to be supported, the legs are forced down by pressing upon the lugs, which are then turned to pass into the notches, thereby locking the legs in place. As the legs rest upon the ground, they prevent the bicycle from falling, and the rider can mount easily. Before starting the bicycle, he pushes the lugs out of the notches by turning the caps, when the springs draw the legs into the casings. In dismounting, the bicycle will stand by simply extending that leg on the side the rider dismounts from. Extending both legs of course supports the machine more securely.

IMPROVED BOTTLE AND STOPPER.

The bottle and stopper here shown are for the purpose of containing poisons, and are so constructed that a certain and more than ordinary amount of manipulation will be required before the stopper or cover can be removed. The bottle is formed with a number of horizontal and vertical grooves, as plainly shown in Fig. 1; near the lower edge of the cover is a lug. The cover is placed upon the bottle so that its lug will enter the highest vertical groove and pass



HOWELL'S IMPROVED BOTTLE AND STOPPER.

into the end of the upper horizontal groove. The cover is then turned to carry the lug along through this groove to the middle vertical one, and so on to the closed end of the lowest groove. With a poison bottle arranged in this way, it will be impossible for the drug clerk to make mistakes by dispensing drugs from the wrong flask, as his attention will be at once called to the character of the drug contained in the bottle when he attempts to remove the stopper. The cover is also formed with a series of points about its upper edge, as shown in Fig. 2.

This invention has been patented by Mr. J. H. B. Howell, of Newton, N. J.

ENGINEERING INVENTIONS.

A rail joint truss has been patented by Mr. John McEwen, of Lawrence, Kan. It consists of a base plate, block, and opposite truss bars, secured to the rails by bolts, to prevent the settling of the end of one rail below the other at rail joints between the ties, to obviate the hammering of car wheels at these joints.

A spring rail frog for railways has been patented by Mr. Joseph E. Clifton, of Geneseo, Ill. It has tie plates with clips, combined with a moving rail and guard and fixed outer rail, with other novel features to obviate the defects in this class of frogs, and increase their durability.

AGRICULTURAL INVENTIONS.

A seed planter has been patented by Mr. George Lovick, of Temple, Tex. Its construction is such that the operator is enabled to see each seed in its passage from the planting wheel to the ground, and so guard against some of the rows being only half planted from the seed spout getting stopped up or the planter wheel failing to act properly.

A universal marker has been patented by Messrs. Elmer J. Hildreth and Thomas R. Miller, of New Haven, Conn. It is for use in marking fields for seed drills, hand planters, and other planting machines, and provides for the convenient adjustment of the shovels or marking points, so they may be grouped or spaced as desired, and any number taken out.

A cotton scraper has been patented by Mr. Richard Cooper, of Greenville, Tex. This invention covers a novel mechanism for a cotton scraper to cut a wider furrow with lighter draught, do the work more perfectly, be more easily held to the row, while the implement may be conveniently disconnected for repairing.

A hay rake and loader has been patented by Mr. Edward A. Gerrard, of Columbus, Neb. The frame has three wheels and but a single central forward wheel for a vehicle which can be drawn across fields to rake up hay, and is provided with means for separating the hay to be elevated from that which is to remain on the ground, with means for holding the rake teeth and means for running the elevator rope.

MISCELLANEOUS INVENTIONS.

An adjustable bedstead has been patented by Mr. Charles A. Jenkens, of New Berne, N. C. This invention covers a novel form of construction for a bedstead which can be used as a crib, a double crib, or a full sized bedstead.

A wagon box has been patented by Mr. Henry Jacobs, of Evansville, Ind. It is formed of sections which can be taken apart and put together very rapidly, making it convenient for one person to place it on or remove it from the running gear of the wagon.

A toilet fan has been patented by Mr. Joseph Silbernik, of New York city. It is light and simple of construction, but it is so made that the fan can be operated by a slight movement of one finger, without its being necessary to move the entire hand.

An adjustable and balancing seesaw has been patented by Mr. Arthur B. Flach, of New York city. It is a novel arrangement of rocking frame with hinged ends on which are the seats, with adjustable foot rests, and so constructed that when not in use it can be readily taken apart and compactly folded.

A shaft support for vehicles has been patented by Mr. Frank P. Chamberlin, of Carlisle, O. It consists of a metal strip carried by the shafts, with a spring carried by the shaft clip, and secured thereto in a novel manner, making an attachment for holding carriage or wagon shafts in an elevated or upright position.

A jump seat iron has been patented by Mr. Andrew F. Shuler, of Arcanum, O. It has front and rear bars of novel design so pivoted to a base bar that a wagon seat constructed therewith can be readily adjusted to form one or two seats, as may be required, the irons being applicable to any kind of vehicle or any kind of seat.

A waist belt buckle has been patented by Messrs. Louis Sanders, of Brooklyn, N. Y., and Harry A. Sanders, of New York city. It is of simple construction, and can be cheaply made, but is so formed that belts can be readily adjusted and firmly secured thereby to lie smoothly in place, while the buckle has a very finished appearance.

A bag or satchel fastening has been patented by Mr. Louis B. Prahar, of Brooklyn, N. Y. This invention covers a simple and novel arrangement of catch plates and a light frame to make a fastening for a purse, pocket book, or a hand bag frame, to hold the frames securely closed, but yet so they can be readily unfastened.

A fastening for hand bags and other articles has been patented by Mr. Louis Sanders, of Brooklyn, N. Y. Combined with a slotted eye plate, attached to one part of the frame, is a stem having a flaring notch in its top, and attached to the other part of the frame, making a fastening intended to be strong and reliable in use and neat in appearance.

A sash fastener has been patented by Mr. Charles Witzel, of Brooklyn, N. Y. This invention provides a novel arrangement of sliding bolts connected with levers and slots, intended to do away with weights and cords as used in an ordinary window, and to hold and lock the sash in any desired position, either raised or lowered.

An illuminated glass sign has been patented by Mr. Francis L. Pisch, of New York city. This invention provides for a sheet metal frame with bars so arranged that different parts of the sign can easily be united and taken apart, as desired for different effects, while the sign will be smooth on the outside, and has no projections in which the dust can settle.

An adding machine has been patented by Mr. Thomas W. Maxey, of Nevada, Mo. It has a number of wheels journaled to be revolved on a shaft, and provided circumferentially with figures to indicate the amount of an addition, so that the numbers in one or more columns may be added by moving levers as many times as there are units in each column.

A mop holder has been patented by Mr. John McWilliams, of New Lebanon, N. Y. Combined with a mop holder, readily adjustable for thick or thin mops, there is a rod hinged on the stick, with a forked piece swiveled on the end of the rod, which forked piece can be used for wringing the mop, and when not in use can be swung back against the stick.

A defecator for cane juice has been patensed by Mr. Leon F. Haubtman, of New Orleans, La. It has a skimming shaft and paddle and scum screen, with various novel features and special details of construction, whereby the scum may be removed automatically, and the valuable parts of the impurities readily preserved and again defecated.

A chenille ornament has been patented by Mr. Christian A. Schmidt, of Hoboken, N. J. It is formed of two or more strands of chenille of varying diameters twisted and bound together, and with which strands of tinsel or other material may be interwoven, to provide trimmings, such as pendants, drops, borders, etc., for furniture, upholstery, and articles of dress.

A machine for filing prescriptions has been patented by Mr. John S. Jarnagin, of Mossy Creek, Tenn. It consists of two reels, with suitable connections, drive gearing, and handles, the prescriptions to be pasted together to form a roll which can thus be wound up, and afterward readily referred to by unwinding from one roll and on another.

A power and speed regulator has been patented by Mr. Christian Rowland, of Lanark, Ill. It consists in the combination of a ratchet clutch mechanism, a driven shaft, and a flywheel rigidly fixed to the shaft at a point between the driven section of the clutch and the point of utilization of the power, for regulating the speed of machines run by hand or power.

A tube cutter has been patented by Mr. Delmer L. Baughman, of Albion, Ind. Combined with a tubular stock is a screw mandrel having a tapered part, with blocks in the stock resting on the tapered part of the mandrel and carrying cutters, the device being adapted for cutting off old boiler tubes in boilers or cutting and finishing off the ends of new tubes after the same have been expanded at one end.

An umbrella handle has been patented by Mr. Albert T. Schlichting, of New York city. The umbrella stick has its lower end screw-threaded, and the handle has a screw-threaded aperture with a cavity for the free ends of the umbrella ribs, so that by turning the handle in either direction it can be moved toward or from the ends of the ribs, to hold or release them.

A fence post has been patented by Messrs. William H. Meyers and Louis Anderson, of Oregon, Wis. It consists of a group of rods bound together at the desired distances above ground, their lower ends bent to form a triangular supporting base, and the rods interlaced to admit of the fence wires being passed between them and to stiffen the post to resist strain.

A fruit crate has been patented by Mr. Cyrus W. Lloyd, of Salisbury, Md. The invention consists in gaining or cutting the vertical strips of both the end and side panels, and fitting the horizontal strips into the gains, extending the ends of one set of panels out flush with the outer sides of the vertical strips of the other side panels, and fastening them by metal angle irons.

A combined fare box and lantern has been patented by Mr. Henry D. Clark, of Rochester, N. Y. This invention covers a novel construction, by the use of which a passenger can drop the fare into the fare box, and then the passenger and conductor can both see the fare after it has been dropped in and before it has been discharged into the money box, that both can be witnesses of its correctness.

A wind engine has been patented by Mr. John Serdinko, of New Braunfels, Tex. It has a vertical circular frame, with a windwheel covered to the half by a hemispherical roof supported by posts, only the lower blades of the windwheel being exposed to the wind, and the power obtained from the wheel being transmitted through a shaft, crank, and pitman rod to the machinery below.

A mechanical telephone diaphragmh as been patented by Mr. William Taylor, of Niles, Mich. It is made of alternate layers of wood or straw pulp pressed into the form of thin sheets or boards and strong cloth, two or three thicknesses of each style of material being united by any suitable cement, making a diaphragm that is strong and durable, and calculated to reproduce messages in clear and soft tones.

A combination lock has been patented by Mr. Andrew J. Calhoun, of Socordo, N. M. It is designed more especially for vault or safe doors, and has a key frame slotted lengthwise to receive one or more notched bolts, and slotted transversely to receive notched keys, which remain in the lock and are adapted to slide through the notches of the bolts, together with a suitable casing inclosing the key frame, and key stems fitted in the vault or safe door to which the lock is applied, and adapted to be engaged with and disconnected from the keys.

A bark shaving machine is the subject of two patents issued to Mr. Benedict Ott, of La Crosse, Wis. The knives or cutters are held in a fixed rim, and the link moved into contact therewith by a revolving carrier. The bark is fed through the hopper through a sort of agitator throat, and by the connections between the sections the tensions and motions given to one are transferred to the others, and the sections are given a tension toward the cutter head, with a motion which prevents clogging, the machine being for cutting tanner's bark into shavings instead of grinding it.

A combined inhaler and atomizer has been patented by Mr. Hugh Thomas, of New York city. This invention provides a novel apparatus for inhaling steam or other vapor, or steam mixed with atomized or medicated materials, and for different modes of inhaling, and may also be used as a douche, greatly increasing the number of uses of such appliances. [For further particulars with reference to this patent address Mr. James M. Henley, 361 Broadway, New York city.]

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Curtis Pressure Regulator and Steam Trap. See p. 350.

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Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 76.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

Hercules Lacing and Superior Leather Belting made by Page Belting Co., Concord, N. H. See adv. page 46.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) W. H. P. writes: I would like a receipt for a preparation to coat over malleable irons that will color them a bronze color, something like Berlin or Tuscan bronze. A leading firm uses common furniture varnish, baking the castings to 400° or 500° heat, but I would like something that I would not have to bake, that is air-drying and cheap. A. A cheap and easily applied bronze color may be made on ironwork by painting with a thin paint, about the color required, and, when nearly dry, brush the articles lightly with bronze powder on a piece of fur or a rabbit's foot. You may obtain any colors in bronze powder and a corresponding oil color through the paint trade. 2. Can I export goods into Canada free of duty, when the article is patented in Canada? A. No.

(2) M. R. A.—To put a high polish on walnut, or any other kind of wood, and preserve the natural color and grain, the Wheeler patent wood filler, made at Bridgeport, Conn., is very highly recommended. It is quicker applied and much more satisfactory for all finishing of natural woods than the old method of rubbing down with varnish and oil.

(3) C. F. desires a receipt for paint with which to paint an iron bath tub. A. Use the best quality of white lead.

(4) H. S. B. desires a receipt for coloring billiard and pool balls. A. For *Black.*—Boil for a short time in a strained solution of logwood, afterward immerse them in a solution of iron sulphate. *Blue.*—Immerse for a short time in a dilute solution of indigo carmine. *Yellow.*—Immerse for about 15 minutes in a solution of potassium chromate. *Red.*—Macerate cochineal in vinegar, and boil the balls in the liquid for a few minutes. *Violet.*—Dye red first, then immerse for an instant in solution of indigo carmine. *Green.*—Dye yellow first, and afterward dip into solution of indigo carmine.

(5) T. R. writes: I have noticed advertisements of preparations claiming to make the hair grow; for example, one will, in a given time, it is said, cause profuse beard to appear. Is this true? A. The use of borax in the water employed for washing, together with stimulating lotions containing small amounts of tincture of cantharides, will have some effect, but not as much as stated, in assisting the growth of the beard, in cases where no impediments (*i. e.*, skin diseases, etc.) exist.

(6) P. D. writes: A flat bottomed boat (sharpie model) fifty feet keel, fifteen feet beam, and scow stern, "drawn in" to twelve feet width, and fifteen inches draught, is required to run eight miles an hour. What would be the dimensions of boiler (locomotive), engine, and screw wheel, to attain above results? Also, what would be approximate weight of boiler and machinery? Boiler and machinery to be as light and to occupy least space practicable. Is there any device in actual use to raise and lower small screw wheels by

means of a universal joint in outboard shaft? A. You will require an engine with cylinder 6 inches by 7 inches, of nominally 8 horse power. A boiler, if vertical, 35 inches diameter, 80 inches high, with 60 2-inch tubes, or a locomotive boiler with shell 24 inches diameter. Fire box 18 inches by 34 inches diameter, 31 inches high, 25 tubes 2 inches, 66 inches long. Estimated weight, 4,000 pounds, complete. Cost, $600 to $700. Screw propeller, 34 inches diameter. Cost, $10. Jointed shafts have been made and used for varying the depth of the wheel, and there are various patents on the same. You would have to design and have made a simple universal joint and depressing gear for the shaft.

(7) C. F. G.—See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 131, 177, 134, 29, 42, 140, 133, and others, which will give you full instructions in building and rigging boats.

(8) C. F. D. asks: 1. A vessel of 1,000 tons displacement is being towed by a vessel of 100 tons displacement at the rate of 8 knots per hour. If the machinery is taken out of the tow boat and placed in the vessel being towed, will it force the vessel through the water at the same rate (8 knots) of speed as she had been towed when machinery was in the tow boat? A. Yes; if the stern lines are sharp, so as to give the screw its full action. 2. What part of a boiler will first show signs of corrosion when using a jet condenser? A. We do not know what the jet condenser has to do with the boiler. Is fresh water or sea water used, and is the boiler fed from the condenser, and where fed?

(9) C. F. writes: I have two double convex lenses (achromatic), each 2 inches diameter and 7 inches focus. I wish to use them, if possible, for a photographic camera. Can I use both, and if so, how far apart must they be set in the tube? What should be the distance from the ground glass to the nearest lens? Where would the best place be for inserting the diaphragm? A. Not knowing the peculiarities of their construction, we can only give you a general consideration of that class of lenses. Place them at half their focal lengths, with the crown sides outward. The diaphragm may be of one-half diameter of lenses for the aperture, or less with quick chemicals. Find the focal field by trial, at about 3 inches from last surface. If found satisfactory on trial, all right; if not, move the lenses a little further or nearer, keeping the diaphragm in the center, until the best effect is produced.

(10) R. B. McK. asks if in artificial stone, made of Portland cement and sand, there is any solution mixed with cement and sand to make it adhesive when turned out of the mould, soon after moulding. A. It is allowed time to partially set in the mould. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 134, 325, 335, treating upon artificial stone.

(11) G. M. A. asks if there is any compound or cement that will make paper stick to the smooth face of an iron pulley effectually. A. Clean the pulley face free from grease, scratch the surface with a file or deaden its polished surface with muriatic acid 1 part, water 2 parts, wash free from acid, and dry. Moisten the paper with a solution of nut galls. Use good common glue, rather thick, on the iron, with a brush, rolling the paper tightly around the pulley either upon a table or by hand. In this way you may apply as many thicknesses as required. The whole will dry solid and hard.

(12) G. E. B.—Drying kilns, whether heated by steam or a stove, should be shut tight until the lumber is thoroughly heated through, to a temperature of 212°, and kept so for a few hours. At this temperature the water is driven out from the interior of the lumber without cracking or checking the surface. Then ventilate gently until all moisture is removed and cool slowly, when you will find your lumber thoroughly dry and shrunk evenly without checks. See also several articles on treatment of wood mentioned in our SUPPLEMENT catalogue.

(13) W. M. S. asks if a radiator of a steam heating apparatus would throw off a black dust or smoke sufficiently to be noticed on showcases in a storeroom. A. Radiators produce a circulation of the dust held in the air, which will lodge on the showcases. There will be no apparent smoke arise, except from a freshly painted radiator.

(14) J. M. B. writes: We need some kind of a material to wipe the lime off our ribbon fencing while it is wet, so that there will not be anything left on it to come off into our machines while it is being barbed. We used very heavy felt, but that will not do. After we treat it in the usual way to clean it, then we drop the spool of wire into a tub of lime water, and this tub is arranged so that the spool will revolve in the lime; then we have a coiler to run it out of the lime tub, so that the lime gets all over it nicely, but too much. We have pressure wipe box, but we don't know what to use in the box. A. We know of nothing better or cheaper than sawdust in a large wipe box. Pass the ribbon horizontally along and near the bottom of the box, have a slot at bottom to let out the moist sawdust as required. A pair of circular brushes revolving just outside of the box will clear the ribbon of adhering sawdust.

(15) F. W. D.—We cannot venture an opinion as to the temperature of the water at the north pole. The temperature of the Pacific equatorial current near the bay of Panama is from 80° to 85°. The temperature of the surface water of the Caribbean Sea is 85°; at a depth of 250 fathoms 48°, at 400 fathoms 43°. Temperature of the surface of the Gulf Stream has been found 80°, while at the bottom it was but 38°. Greatest temperature of the Gulf Stream, 86°. Highest temperature known in the equatorial Pacific Ocean, 90°, and near the islands, 95°. Have no record of the Aqullas current at Cape of Good Hope. The Mozambique current is about 83°.

(16) M. J. S.—A balloon with hydrogen gas should be 7¼ feet diameter, and 11 feet high, of the usual shape, as illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 127, 146, for sustaining 15 pounds. It should be made of Marseilles or Chinese silk. The silk must be varnished with rubber, well dried, cut to shape and sewed, the seams being varnished last. It cannot be bought prepared. It can be filled with hydrogen gas as made with sulphuric acid, water, and zinc, or with iron turnings. Gas should be washed by passing through water. Ordinary illuminating gas will do, but requires a balloon six times larger in capacity.

(17) G. L. P.—The use of the siphon for the purposes of a water ram to elevate water would be of great value in a few special cases. The common water ram is so cheap and well known that it can hardly be expected to be superseded by a new device that may not be so easily managed or started. If you can make the siphon so that it can be protected from freezing as easily as a ram, it might be made profitable. We can think of but few places where it would become a necessity.

(18) C. asks the working horse power from speed of shaft 265 turns per minute; size of pulleys, 24 inches diameter each; belt, 4 inches single rubber; belt runs nearly on level. A. 6½ horse power. 2. Also, size pulleys with same belt for 6 horse power with same speed? A. 23 inches.

(19) J. G. asks for the latest method of making good soap from vegetables, either by hot or cold process? A. See the articles on the "Manufacture of Toilet Soaps," contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 518, 519, and 525. 2. The most practical way of destroying the odor of common Mexican whisky made from sugar cane. A. The odor can be removed by filtering through charcoal or shaking with charcoal and then straining; as this will remove the color, add a little burnt sugar or caramel to the filtered liquid. 3. The quickest and best receipt for making beer? A. See article on "Lager Beer," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 318.

(20) D. C. B. asks: 1. Does constant use tend to diminish the magnetic power of lodestones? A. If by constant use you mean allowing the lodestone to constantly sustain a load, such use will tend to strengthen rather than weaken the lodestone. But frequent removal of the armature or load, or jarring, tends to diminish its power. 2. Is there any known metal or substance in which a lodestone may be enveloped so that the power of attraction of the stone will be bottled, or rather, neutralized? A. We know of no substance that will answer your purpose. 3. If nothing is known of what will totally arrest its power of attraction, what will do so to the highest degree? A. There is no magnetic insulator; but a plate of iron placed before the lodestone or magnet absorbs and apparently masks the magnetism.

(21) H. J. D. asks: 1. Are the prepared carbon plates for a Smee battery as good as platinized silver and as durable? A. We think there is very little difference between the platinized silver and the carbon. 2. Can I purify old punched silver coins so that they will be cheaper for plating than to buy pure silver? I have a furnace and small laboratory. A. It is not a simple matter to refine silver; there is no objection to using the old coin without refining it.

(22) W. R. says: Please inform me how to improve the memory by a short and quick method. A. It can only be done by real effort. Commit something to memory every day. Begin one of Shakespeare's plays, and never give up until you can repeat the whole rapidly without a mistake.

(23) G. S. asks us for books, treating of the science of electricity for a beginner? Also, where they could be obtained, and the probable cost of same. I am working where we have two Weston dynamo-electric machines, and having a great deal of spare time to myself, I could study and experiment with it considerably. A. We recommend Thompson's "Elementary Electricity," price $1.25, also Thompson's "Dynamo Electricity," price $5.00. We can furnish you with these books. 2. Also, please inform me if there is any known process of refining oil by electricity? A. We do not know of any process of refining oil by electricity.

(24) J. F. M. desires a recipe for re-inking purple type ribbons. A. Use:

Aniline violet	¼ ounce.
Pure alcohol	15 "
Concentrated glycerine	15 "

Dissolve the aniline in the alcohol, and add the glycerine.

(25) C. R. P.—The sample of binding twine you send is all Sisal hemp. Manila is finer, and has a soft feel, silky luster, and of a straw color when laid beside the Sisal. Manila is much higher in price.

(26) W. H. S.—Quicksand is very fine pure silica or silicate of iron worn nearly round, and owes its plasticity in water to its rounded and polished surface. It is found on some of the Southern sea beaches, and often found overlying clay beds, in the waterways of wells. There is a noted location at the New York navy yard and the adjoining Wallabout.

(27) T. H. B. asks whether the Russian government has yet found a cheap way (without using fuel) of obtaining drinking water from the brackish water in the country bordering on the Caspian Sea. A. We know of no new method having been applied in this direction.

(28) G. & M. ask how much pressure to the square inch it requires to stop a car with a 33 inch wheel going at a high rate of speed. A. If you mean the direct pressure upon the brakes, the pressure commonly used is from 600 to 1,000 pounds on each cross bar, or half the above on each shoe.

(29) J. M.—Gas meter valves and seats are made of tin 3 parts, antimony 1 part. In a three-bellows meter, the area of the three inlet valves should be twice the area of the inlet pipe, or each valve two-thirds area of inlet pipe.

(30) F. W.—Electro silicon is the latest and probably the best polishing powder now known for brass, German silver, and silver plate. It is silica of infinite fineness, and much of the appearance of chalk. When it is finely pulverized from the lumps, and mixed with just enough glycerine to make it adhere as a paste, you will find it a valuable polishing paste, and suited to your wants.

(31) W. D. B.—The idea of a balanced or frictionless slide valve is not new. It is in use, and there are many patents on various devices for this purpose. If you will send us drawings or a model, we will ascertain the probability of your obtaining a patent.

(32) A. L.—The Colt barrels are mottled by spattering the coloring matter over them after they are finished bright. We do not know their receipt for the coloring matter, but suppose that it is gallic acid.

(33) J. W. A. asks: Is there any chemical that will deodorize cistern water, rendered offensive on acconnt of a wooden pump? A. Know of nothing better than thorough cleaning out of cistern, Take out pump, clean and dry it, then give it a coat of melted resin, inside and outside; drive in the resin with a hot iron. Any chemicals will either make the water hard or add to the odor of goods washed in it.

(34) A. C. R. and F. H. ask: 1. Is the energy of a pound pressure of steam generated at an altitude of 11,000 feet as great, and capable of doing the same amount of work, as the energy of a pound pressure of steam generated at sea level and measured with the same gauge? Or does it vary in a ratio equal to the resistance of atmospheric pressure to overcome at the different altitudes? A. There can be no difference in the value of the energy from steam pressure as measured by a steam gauge under any conditions of atmospheric pressure. The gauge actually measures the difference between the inside and outside pressure, which is the real measure of energy. 2. Is the latent heat of steam generated by water boiling at 190 degrees as great as the latent heat of steam generated by water boiling at 212 degrees, and does it require more water to generate a pound pressure of steam at an altitude of 11,000 feet than at sea level? A. The latent heat of steam generated from water boiling at 190 degrees is greater than steam from water boiling at 212 degrees in the open air. The sum of the sensible and latent heat of steam being the same for different temperatures, with the exception of a slight increase with the temperature, would indicate less water for a given pressure under decreased atmospheric pressure.

(35) W. J. M. asks: 1. What is the horse power of the following described engine, viz., cylinder, 8 in.; stroke, 10 in.; boiler pressure, 100 lb.; revolutions, 180? A. Engine developing 30 horse power. 2. What horse power boiler, as follows, viz., boiler shell, 4 ft. high by 10 ft. long; 36 three inch flues; the fire box is within the boiler shell, being 2 ft. diameter, running the entire length of boiler? A. Boiler rates 27 horse power as stated. If you use the lower half of shell for heating surface, add 5 horse power to above. 3. How to obtain the average pressure of steam per square inch on piston? A. The average or mean pressure may be calculated by knowing the exact point of cut-off and the ratio of expansion for given initial pressure, which are tabulated in works on steam engineering. For your engine we assume the cut-off at half stroke, with the usual clearance. For special information in relation to mean effective pressure and indicator cards, with description of leading American engines and their theories, we refer you to Edwards' "Practical Steam Engineers' Guide," $2.50, which we can furnish.

(36) F. J. W. asks: 1. Can freckles be removed from the face properly without injury to the skin, and how? A. They can. See article on this subject, page 210, SCIENTIFIC AMERICAN for Oct. 3, 1885.

(37) W. H. B. desires a remedy by which he can rid a place of rats, without the use of poison. A. It is said that a singed rat will drive his fellows away. Chloride of lime sprinkled around their holes is sometimes partially effective. But ferrets are the most radical means. They kill them when they catch them. They can be purchased for $15 per pair, or hired at the rate of $5 per night.

(38) K. R. P. asks for directions for making an indelible ink for marking linen, red preferred. A. Take enough finely pulverized cinnabar to form a moderately thick liquid, and very intimately mix with egg albumen previously diluted with an equal bulk of water, and beaten to a froth, and filtered through fine linen. Marks formed on cloth with this liquid, by means of a quill, are fixed, after they have become dry, by pressing the cloth on the other side with a hot iron. See also recipe given on page 406 of SCIENTIFIC AMERICAN for Dec. 26, 1885.

(39) A. B. asks the best way to take the rust off the steel spokes of a bicycle that has been lying in a garret all winter? A. You can only rub the rust off and retain a polish by using flour of emery cloth with a little oil.

(40) J. H. asks how to make pure bay rum. A. Take two pounds of leaves of the Myrtus acris, half pound cardamoms, two ounces cassia, one and a half ounces cloves, and nine quarts rum. Distill one and a half gallons. Bay rum may be colored with tincture of saffron or with a mixture of equal parts of caramel and tincture of turmeric.

(41) J. G. desires a receipt to give pictures of water colors a glossy appearance. A. The water colors having previously been coated with 2 or 3 coats of thin starch or rice boiled and strained through a cloth, they are covered with a varnish consisting of dextrine 2 parts, alcohol ½ part, and water 2 parts.

(42) M. S. asks: 1. How to remove hair from the face, permanently, without injury. A. By electricity (see SUPPLEMENT, No. 176) or by depilatories (see answer to question 56, No. 4, vol. 51). 2. How to remove a wart from the hand. A. Take of

Salicylic acid	gr. xxx.
Ext. cannabis indic	gr. x.
Collodion	ʒ ss.

Mix and apply.

(43) M. E. B. desires: 1. A receipt to make composition for treeing shoes? A. Dissolve gum tragacanth in water, then a little ink to make it black, and finally add a small quantity of neatsfoot oil. It must be quite thin, or else, if thick, it is liable to cake. 2. A receipt for dressing? A. Take of:

Gum shellac	½ pound.
Alcohol	3 quarts.

Dissolve and add

Camphor	1½ ounces.
Lampblack	2 "

(44) B. T. H. asks: Is there any real value in sulphate of iron as an antiseptic in waste pipes? If so, should the solution be used hot? A. Iron sulphate has long been considered a valuable disinfectant, but as fashions change, so do disinfectants, therefore we call your attention to the article on "Disinfectants," given on page 393 of the SCIENTIFIC AMERICAN for Dec. 19, 1885. See also "Cleaning out Waste Pipes," in SCIENTIFIC AMERICAN for Jan. 16, 1886.

(45) J. S. B. asks what will make leather stick to brass? A. Melt together equal parts asphalt and gutta percha, and apply hot under a press.

(46) C. E. S. asks what is used to make a finish on leather like sample inclosed? A. We should think it was made by a thin coating of size from hide cuttings, but possibly it is shellac varnish, if put on after the leather is formed as you send it.

(47) Lens asks if a wide angle lens, 6 inches equivalent focus, will work as rapid for instantaneous pictures as a more expensive lens of a rapid rectilinear type of a longer focus? A. No; the wide angle lens, with its largest stop, obstructs more light than could pass were there no stop. If no stop were used, no focus could be obtained. The same rule applies to single lenses of the cheap type. A stop of some kind must be used to obtain a good focus. With the rectilinear type of lens, such as the Ross, Dallmeyer, Steinheil, Bick, Darlot, and others, while the equivalent focus is longer, excellent definition is obtained when they are used with full aperture. With no stop the full power of the light passes unobstructed through the lens, and a much more brilliant, stereoscopic-like image will be seen on the ground glass than is possible with a wide angle or cheap lens. Rapid rectilinear lenses are therefore superior to all others for instantaneous work, and are exclusively used by professional and amateur photographers.

(48) P. Y. M.—See Muspratt's Chemistry, Ure's Dictionary, and encyclopdias at Astor Library. A reader of the SCIENTIFIC AMERICAN for 25 years should not forget to send his *full* address. The street and number are always necessary in large cities.

(49) W. H. L. asks what will take out ink spots from white table cloth, caused by Spafford's commercial ink. Oxalic acid does not seem to touch it, as in the case of ordinary iron inks. A. Use a cold aqueous or acetic acid solution of calcium hypochlorite, or try bleaching powder or javelle water.

(50) H. E. R. desires a receipt for a good and reliable cement for leather, etc. A. Common glue and isinglass, equal parts. Soak for ten hours in just enough water to cover them. Bring gradually to a boiling heat, and add pure tannin until the whole becomes ropy or appears like the white of eggs. Buff off the surfaces to be joined, apply this cement warm, and clamp firmly. See also SUPPLEMENT, 158, for a great variety of cements.

(51) G. L. L. desires a good recipe for bird lime? A. Boil the middle bark of holly 7 or 8 hours in water, drain it, and lay it in heaps on the ground, covered with stones for two or three weeks, till reduced to a mucilage. Beat this in a mortar, wash it in rain water, and knead it till free from extraneous matters. Put it in earthen pots, and in 4 or 5 days it will be ready for use.

(52) R. I. B. writes: I have a handsome vase, of what I understand was verd-antique marble. It is a dark green, mottled with lighter green, and stands about 1 ft. 3 in. high and 1 ft. diameter. It has been shattered, and I wish to mend it as perfectly as possible; all the parts fit so nicely one can hardly tell where fractured. Will you please tell me how to mend it? The vase is considered valuable, not only in itself, but on account of its associations. A. Take plaster of Paris, and soak it in a saturated solution of alum, then bake in an oven, the same as gypsum is baked to make plaster of Paris; after which grind the mixture to powder. It is then used as wanted, being mixed up with water like plaster and applied. It sets into a very hard composition, capable of taking a very high polish, and may be mixed with various coloring minerals to produce a cement of any color capable of imitating marble.

(53) F. H. S. and others.—If gypsum is overburnt, that is, heated over 204°, it loses the property of hardening with water. Common land plaster is not burnt, simply ground, in this country.

(54) D. E. B. asks: What evidence have we, or how is it known, that the shape of the earth at the poles is flat? A. Because the polar diameter is 26 miles less than the equatorial diameter.

(55) C. T. P. asks for a formula for making an illuminating substance for clock dials, etc. A. See "How to Make Luminous Paint," contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249 and 497.

(56) G. H. L. desires a recipe to make wax into a liquid to be used in writing, so it will afterward become dry. A. Dissolve it in alcohol, ether, or some essential oil, which, when written with, will evaporate, leaving the characters present in wax.

(57) H. C. A. asks how to make black and red ink for rubber stamps. A. The composition consists of 5 parts glycerine, 1 part water, 1 part gelatine, and 6 parts coloring matter, generally aniline dyes, although carmine and Prussian blue may be used, if preferred.

(58) A. P. J. asks: 1. With equal loads, which will draw the easier—a two or a four wheeled cart, both carts weighing the same? A. On a smooth road there is very little difference; on a rough road four wheels are the easier. 2. If four wheels draw easier than two, would six be easier than four? If not, why not? A. The same conditions would apply as above; it would be dependent upon distribution of load and condition of road.

(59) J. K. asks how to make a composition for small printing press rollers? A. Take of Cooper's best glue 8½ pounds, extra sirup 2 gallons, glycerine 1 pint, Venice turpentine 2 ounces. Steep the glue in rain water until pliant, and drain it well. Then melt it over a moderate fire, but do not "cook it." Next put in the sirup and boil three-quarters of an hour, stirring it occasionally and skimming off impurities arising to the surface. Add the glycerine and turpentine a few minutes before removing from the fire, and pour slowly. Slightly reduce or increase the glue as the weather becomes colder or warmer.

(60) H. E. asks (1) if the inclosed sample contains anything but lead. If so, what? A. The sample is not lead, but an alloy, probably Britannia metal, consisting of copper 1 part, zinc 2 parts, tin 81 parts, and antimony 16 parts. 2. In making a casting with this metal, 6½ by 3 inches, one-sixteenth inch thick, do the brass moulds have to be hot or warm to give the face a smooth look, like inclosed sample? A. Brass moulds cannot be used, but they must be cast in well polished iron moulds under pressure. 3. What is the best etching fluid to use on this metal? A. Use nitric acid (aqua fortis).

(61) C. I. asks: 1. What is the best wood for ebonizing? A. Cherry. 2. Give full directions for ebonizing. A. Dissolve 4 ounces shellac with 2 ounces borax in ½ gallon water. Boil until a perfect solution is obtained, then add ½ ounce glycerine, of aniline black soluble in water a sufficient quantity, and it is ready for use. See also SCIENTIFIC AMERICAN for August 1, 1885, page 72.

(62) A. E. H. desires a receipt for glycerine jelly, used for mounting microscopical objects. A. Take a quantity of Nelson's gelatine, soak it for 2 or 3 hours in cold water, pour off the superfluous liquid, and heat the soaked gelatine until melted. To each fluid ounce of the gelatine, while it is fluid but cool, a fluid drachm of the white of an egg is added. Boil this until the albumen coagulates and the gelatine is quite clear, then filter it through fine flannel, and to each ounce of the clarified solution add 6 drachms of a mixture composed of 1 part glycerine to 2 parts of camphor water.

(63) J. T. asks: What is the composition and nature of "agate," used for coating kitchen utensils, and will it bear heat and cold under pressure? A. The following produces a white and harmless coating: Powdered flints, calcined borax, pure clay, and a little feldspar are finely ground together and made into a paste with water. The iron ware being cleaned with dilute sulphuric acid, and well washed with water, the paste is applied to it with a brush. While this is still moist, it is dusted over with a glaze composed of feldspar, carbonate of soda, borax, barium sulphate, and a little tin oxide. The utensils are allowed to dry gradually, and are lastly heated in a muffle at a bright red heat until the glaze is fused in a uniform manner. They will stand considerable heat and cold under pressure.

(64) A. B. J. asks (1) how to clean kid gloves. A. For cleaning, see answer to query 18, contained in SCIENTIFIC AMERICAN for October 24, 1885. 2. How to dye old kid gloves black? A. The glove is washed in alcohol, and three times brushed over with a decoction of logwood, allowing between each brushing ten minutes for drying, afterward dipping into a solution of iron sulphate and then brushing with warm water. Should the color not prove sufficiently dark, a decoction of quercitron may be added to the logwood decoction. Instead of the sulphate of iron, some nitrate of iron may be used. As the leather begins to dry, it is rubbed over with talc powder and some olive oil and pressed between flannel. The treatment with talc and oil is repeated, and the glue allowed to dry on the stretch wood. 3. Where could I get the wood hands or forms used to draw the gloves on to dye? A. They are to be had from all dealers in glover's materials.

(65) R. H. asks if there is any means of discovering gold by its attracting powers. A. There are no means known except regular miners' methods by which the presence of metal can be satisfactorily determined. Magnets are attracted by iron ore. 2. What books are the best on physiognomy? A. We can send you "Indications of Character," price 25 cents; "Heads and Faces, and How to Study Them," price $1.00; "New Physiognomy," by S. R. Wells, price $5.00.

(66) J. P. O. asks what process to put parchment documents through, that have been steamed in a safe, and have drawn up and become stiff, in the late fire at Galveston. I have some land patents that formerly were 4x10 inches, and now they are about 1⅛ inches diameter and 4 inches long. They were in a large safe, and although the fire burnt away from the safe in less than an hour, everything of a leathery nature, such as backs of books, was entirely destroyed. A. We do not believe you can more than partially restore them, but would advise you to heat them with steam until they become pliable and then stretch them out as well as possible, taking care to prevent their becoming saturated with moisture, or they will pulp.

(67) H. S. desires a remedy for the removal of spots on the face resembling freckles. A. The following treatment, which is used for moles, may be found effective: Take tartar emetic in impalpable powder 15 grains, soap plaster 1 drachm, and beat them to a paste. Apply this paste to nearly a line in thickness (not more), and cover the whole with strips of gummed paper. In 4 or 5 days, eruption or suppuration will set in, and in a few days after leave only a very slight scar.

(68) J. P. R. asks why he failed to make platinum chloride adhere to a silver deposit in trying to get a black with it. A. We would advise you to use a solution of silver nitrate instead of platinum chloride. The article is dipped in the solution mentioned, then heated in the flame of a Bunsen burner until black, and finally all superfluous black removed by means of a rag dipped in sweet oil. This method will be found more economical and fully as satisfactory as the one used by you.

(69) G. M. M. writes: A white marble bust was discolored by smoke and water. Inform me the best mode of cleaning it. A. Take 2 parts of common soda, 1 part of pumice stone, and 1 part of finely powdered chalk; sift it through a fine sieve, and mix it with water; then rub it well all over the marble, and the stains will be removed; then wash the marble all over with soap and water, and it will be as clean as it was at first.

(70) E. S. A. S. asks: What is the cause of the Gulf Stream? A. The Gulf Stream is but a single portion of the great system of oceanic currents; the explanation of the phenomena would require too much space for this department. Text books on geography or geology will explain the details of the theory. 2. What will take ink spots out of marble? A. Take ½ ounce antimony chloride and 1 ounce oxalic acid, and dissolve them in 1 pint rain water; add flour, and bring the composition to a proper consistence. Then lay it evenly on the stained part with a brush, and after it has remained for a few days wash it off, and repeat the process, if the stain is not quite removed. 3. Is there any cure for flesh worms? A. See answer to query 8 given in SCIENTIFIC AMERICAN for February 21, 1885.

(71) J. Z. S. desires a few rules for a very lean person to increase his weight to a much larger amount—diet, etc. A. Much depends upon individual temperament, but by refraining largely from exercise, avoiding care and worry, and following a diet liberally composed of sugary and starchy elements, with milk and butter and yolk of eggs, fat meat, etc., one can generally largely increase his weight.

(72) W. H. R. asks: How is the high polish put on gilt frames? Is it gold leaf or a composition? One part a high polish, while on a strip alongside of it the gold is dead. How is the composition made that the flowered wood is made of on frames? A. The high polish referred to is obtained by burnishing a portion of the gold leaf. The moulding may be prepared as follows: Mix 14 pounds of glue, 7 pounds of resin, ½ pound of pitch, 2½ pints linseed oil, spirits of water, more or less, according to the quantity required.

(73) J. H. W.—Steam at 5 pounds pressure is about 224° temperature, and may be estimated at 8 per cent more effective than water at 212° for the same area of radiating surface. You will require nearly 2½ feet 1¼ inch pipe with steam at 5 pounds to equal a foot of 4 inch hot water pipe at 212°.

(74) H. G. A. writes: I am transmitting about 2 horse power through a set of gears that make 50 revolutions a minute, and they wear out in a short time. Will they last longer, and about how much, if I transmit the same power through them, but increase their speed to 150 revolutions per minute? A. You will gain nothing in wear on your gear by increasing the speed. The contact of the teeth, although with less strain, will have three times the quantity of contact, with an increase of back lash or vibration which adds to the wear, and also to the noise.

(75) G. P. T. speaks of a fire starting in a mattress stuffed with fine shavings, and asks if the mattress could have become ignited by spontaneous combustion. A. Very probably, if the mattress has been wet.

(76) C. H. B. writes: I have a polyopticon, with lens 1¾ inches diameter and 4 inches focus. Owing to size of lens, my pictures must not be larger than 1¼ inches diameter, and, unless they are perfect pictures, the result is not what I would like. I want to get a larger and clearer image. If I use lens 2 inches diameter and about 3½ inches focus, shall I attain the desired end? A. Your single lens 2 inches diameter and 3½ inches focus will not give a satisfactory image, nor cover the required field; two plano-convex lenses of 2 inches diameter, 8 inches focus, placed from 2 to 3 inches apart, with their convex faces next to each other, set so as to adjust their distances for the best effect, will enable you to project a picture 2 inches to 2¼ inches diameter.

(77) F. J. W.—If you are handy at tinkering, and really ambitious to learn a regular trade, it is now time (age 18) to make a start in earnest by going into the nearest machine shop, beginning, if necessary clear down at the bottom, a mere laborer or blacksmith's helper, it matters not which, if you are only there to see how things are done, industrious, and lose no opportunity to make yourself useful.

(78) G. L. C.—With the best rams now made on the same principle, water can be raised 150 feet or more, and in quantity from one-fifth to one-fifteenth the quantity used, according to the available conditions of feed pipe and height. A siphon cannot be relied on for more than 25 feet lift.

(79) G. K. asks: Which are the most powerful reflectors in use? A. The parabolic reflectors of our locomotives are the most powerful form that has yet been devised.

(80) C. H. I. asks the best receipt for keeping auger bits of cast steel from rusting. A. Wipe them with tallow; warm the bit, using the tallow on a rag. Vaseline or oil on a rag in the tool box is a ready means of preventing rust.

(81) M. G. F. & F. L. W.—Wind has no effect upon a thermometer, if otherwise protected from radiation from the ground or buildings. A thermometer, to indicate the temperature of the air, uniform with the regulations as issued by the Smithsonian Institution, should be sheltered from the sun, and from radiation, by being placed in a latticed cage of about a cubic foot space, so much open on one side as to admit of observation, the cage to be sheltered from the direct rays of the sun, and thermometer protected from rain.

(82) D. D. J. asks how to make a compound used for coating small pieces of steel intended to cast into iron. Where nothing is used, the iron does not lie to the steel, and blow holes are formed, which spoil the castings. I have seen a compound used, of which one of the ingredients is nitric acid, which entirely prevents blowing, and the iron and steel in the casting seem to be almost fused together. A. The pieces of steel are cleaned free from scale by mixture of hydrochloric acid 1 part, water 3 parts, then washed in hot water, then dipped in muriate of zinc (ordinary soldering acid) and dried. Put the pieces into the mould as hot as can be handled.

(83) A. C. L. asks (1) how to remove machine oil and gasoline from the floor and siding of a frame building which some tenants have so completely saturated as to increase the fire risk and injure the appearance. A. It will not be possible to remove the oil, but the appearance of the wood may be improved by coating it with shellac and then painting the surface. 2. How is paper such as is used to wrap butter or candy coated with paraffine? A. Unsized paper is dipped in a solution of paraffine, or else the paper is waxed by means of heat being applied to beeswax, which is then absorbed by the paper. There are several patented machines for the purpose. 3. How can I make a paste which will unite such paper? A. Use a rubber cement. See recipe given in article on "Cements" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158. 4. How can I transfer a gold leaf sign from the glass of one store window to that of another? A. We know of no means by which this can be done.

(84) A. M. H.—The injector is considered the most economical for feeding boilers, and is no doubt economical for raising water. It is not in use for that purpose, because it heats the water. For a regular water supply, it is not reliable. There is no work on steam jets and injectors. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 212, on the theory of Giffard injector, and No. 356 for illustrations of various kinds of injectors.

(85) W. H. asks how to brown gun barrels. A. Rub the clean barrel with chloride of antimony mixed with a little olive oil; leave a thin coat on the barrel until the required degree of browning is reached. Then wash in hot water and soda, dry, and oil with boiled linseed oil. Varnish with shellac.

(86) C. S., Jr., asks: 1. What is the reason that the recoil in a pistol is greater than in a rifle chambered to use the same cartridge? A. Because the rifle is heavier, and absorbs the recoil. 2. Why is it that the penetration is greater in the latter than in the former? A. Because by the greater length of the barrel of the rifle the cartridge gives its full effect; also the recoil of the pistol is so much lost power in the bullet by lessening its velocity. 3. What good are the grooves in the bullet of the rifle cartridge? A. The rifling of a gun adds to the accuracy of the flight of the bullet by causing it to spin.

(87) G. A. W. asks: What is the cause of the humming, buzzing sound which is sometimes heard around telegraph poles and wires? A. The humming is caused by the vibration of the wires by the action of the wind, on the principle of the Æolian harp. A very slight breeze will set the wires into active vibration.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

T. H.—No. 1 is a silicious mineral containing carbonate of lime, and is of no apparent value. No. 2 is a clay slightly colored with iron oxide. It resembles ocher, and might be used as a paint if ground and mixed with oil.

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